

SEQUENCE LISTING

<110> St. Geme, Joseph W.

<120> HAEMOPHILUS ADHERENCE AND PENETRATION PROTEINS

<130> A-59941-1/RFT/DCF/DHR

<150> US 08/296,791

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<160> 58

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Asp Tyr Gln Tyr Tyr Arg Asp Phe Ala Glu Asn Lys Gly Lys Phe Thr
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Gly Thr Ser Met Thr Lys Ala Pro Met Ile Asp Phe Ser Val Val Ser
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Ala His Asn Val Gly Tyr Thr Asp Val Asp Phe Gly Ala Glu Gly Asn			
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Asn Pro Asp Gln His Arg Phe Thr Tyr Lys Ile Val Lys Arg Asn Asn			
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Tyr Lys Lys Asp Asn Leu His Pro Tyr Glu Asp Asp Tyr His Asn Pro			
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Arg Leu His Lys Phe Val Thr Glu Ala Ala Pro Ile Asp Met Thr Ser			
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Asn Met Asn Gly Ser Thr Tyr Ser Asp Arg Thr Lys Tyr Pro Glu Arg			
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Val Arg Ile Gly Ser Gly Arg Gln Phe Trp Arg Asn Asp Gln Asp Lys			
180	185	190	
ggc gac caa gtt gcc ggt gca tat cat tat ctg aca gct ggc aat aca			683
Gly Asp Gln Val Ala Gly Ala Tyr His Tyr Leu Thr Ala Gly Asn Thr			
195	200	205	
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Val Arg Lys Ala Gly Glu Tyr Gly Pro Leu Pro Ile Ala Gly Ser Lys			
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Gly Asp Ser Gly Ser Pro Met Phe Ile Tyr Asp Ala Glu Lys Gln Lys			
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Trp Leu Ile Asn Gly Ile Leu Arg Glu Gly Asn Pro Phe Glu Gly Lys			
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Tyr Thr Ile Ser Gly Asn Asp Asn Gly Gln Gly Ser Ile Thr Gln Lys			
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gat caa aaa caa gga tca tta atc ttc gca tct gac att aac caa ggg Asp Gln Lys Gln Gly Ser Leu Ile Phe Ala Ser Asp Ile Asn Gln Gly 370	375	380	1211
gcg ggt ggt ctt tat ttt gag ggt aat ttt aca gta tct cca aat tct Ala Gly Gly Leu Tyr Phe Glu Gly Asn Phe Thr Val Ser Pro Asn Ser 385	390	395	1259
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acc ttt aaa cgt atc caa aat acg gac gag ggg gca atg att gtg aac Thr Phe Lys Arg Ile Gln Asn Thr Asp Glu Gly Ala Met Ile Val Asn 515	520	525	1643
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Phe	Pro	Asp	Thr	Leu	Pro	Asp	Gln	Ser	Leu	Leu	Asn	Ala	Leu	Glu		
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Glu	Ala	Glu	Lys	Gln	Arg	Lys	Gln	Lys	Asp	Leu	Ile	Ser	Arg	Tyr		
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Asp	Ser	Asp	Ala	Phe	Arg	Ala	Tyr	Gln	Gln	Lys	Thr	Asn	Leu			
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Arg Lys Ala Ile Asn Tyr Gly	Val Asn Ala Ser Tyr	Gln Phe Arg	
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Leu Gly Gln Leu Gly Ile Gln	Pro Tyr Phe Gly Val	Asn Arg Tyr	
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Phe Ile Glu Arg Glu Asn Tyr	Gln Ser Glu Glu Val	Arg Val Lys	
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Thr Pro Ser Leu Ala Phe Asn	Arg Tyr Asn Ala Gly	Ile Arg Val	
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Asp Tyr Thr Phe Thr Pro Thr	Asp Asn Ile Ser Val	Lys Pro Tyr	
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Phe Phe Val Asn Tyr Val Asp	Val Ser Asn Ala Asn	Val Gln Thr	
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Thr Val Asn Leu Thr Val Leu	Gln Gln Pro Phe Gly	Arg Tyr Trp	
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130 135 140

Arg Leu His Lys Phe Val Thr Glu Ala Ala Pro Ile Asp Met Thr Ser
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Asn Met Asn Gly Ser Thr Tyr Ser Asp Arg Thr Lys Tyr Pro Glu Arg
165 170 175

Val Arg Ile Gly Ser Gly Arg Gln Phe Trp Arg Asn Asp Gln Asp Lys
180 185 190

Gly Asp Gln Val Ala Gly Ala Tyr His Tyr Leu Thr Ala Gly Asn Thr
195 200 205

His Asn Gln Arg Gly Ala Gly Asn Gly Tyr Ser Tyr Leu Gly Gly Asp
210 215 220

Val Arg Lys Ala Gly Glu Tyr Gly Pro Leu Pro Ile Ala Gly Ser Lys
225 230 235 240

Gly Asp Ser Gly Ser Pro Met Phe Ile Tyr Asp Ala Glu Lys Gln Lys
245 250 255

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275 280 285

Glu Arg Asp Leu His Thr Ser Leu Tyr Thr Arg Ala Gly Asn Gly Val
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Tyr Thr Ile Ser Gly Asn Asp Asn Gly Gln Gly Ser Ile Thr Gln Lys
305 310 315 320

Ser Gly Ile Pro Ser Glu Ile Lys Ile Thr Leu Ala Asn Met Ser Leu
325 330 335

Pro Leu Lys Glu Lys Asp Lys Val His Asn Pro Arg Tyr Asp Gly Pro
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Asn Ile Tyr Ser Pro Arg Leu Asn Asn Gly Glu Thr Leu Tyr Phe Met
355 360 365

Asp Gln Lys Gln Gly Ser Leu Ile Phe Ala Ser Asp Ile Asn Gln Gly
370 375 380

Ala Gly Gly Leu Tyr Phe Glu Gly Asn Phe Thr Val Ser Pro Asn Ser
385 390 395 400

Asn Gln Thr Trp Gln Gly Ala Gly Ile His Val Ser Glu Asn Ser Thr
405 410 415

Val Thr Trp Lys Val Asn Gly Val Glu His Asp Arg Leu Ser Lys Ile
420 425 430

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Ile Ser Val Gly Asp Gly Lys Val Ile Leu Glu Gln Gln Ala Asp Asp

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455

460

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Gly Thr Val Gln Leu Asn Asp Asp Lys Gln Phe Asp Thr Asp Lys Phe
485 490 495

Tyr Phe Gly Phe Arg Gly Arg Leu Asp Leu Asn Gly His Ser Leu
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Thr Phe Lys Arg Ile Gln Asn Thr Asp Glu Gly Ala Met Ile Val Asn
515 520 525

His Asn Thr Thr Gln Ala Ala Asn Val Thr Ile Thr Gly Asn Glu Ser
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Ile Val Leu Pro Asn Gly Asn Asn Ile Asn Lys Leu Asp Tyr Arg Lys
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595 600 605

Lys Gly Lys Leu Phe Phe Ser Gly Arg Pro Thr Pro His Ala Tyr Asn
610 615 620

His Leu Asn Lys Arg Trp Ser Glu Met Glu Gly Ile Pro Gln Gly Glu
625 630 635 640

Ile Val Trp Asp His Asp Trp Ile Asn Arg Thr Phe Lys Ala Glu Asn
645 650 655

Phe Gln Ile Lys Gly Gly Ser Ala Val Val Ser Arg Asn Val Ser Ser
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Ile Glu Gly Asn Trp Thr Val Ser Asn Asn Ala Asn Ala Thr Phe Gly
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690 695 700

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725 730 735

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755 760 765

Ile Gly Asn Ile Arg Leu Ser Asp Asn Ser Thr Ala Thr Val Asp Asn
770 775 780

Ala Asn Leu Asn Gly Asn Val His Leu Thr Asp Ser Ala Gln Phe Ser
785 790 795 800

Leu Lys Asn Ser His Phe Ser His Gln Ile Gln Gly Asp Lys Gly Thr
805 810 815

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Asp Tyr Ile Leu Ser Val Arg Asn Thr Gly Lys Glu Pro Glu Thr Leu
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Glu Gln Leu Thr Leu Val Glu Ser Lys Asp Asn Gln Pro Leu Ser Asp
930 935 940

Lys Leu Lys Phe Thr Leu Glu Asn Asp His Val Asp Ala Gly Ala Leu
945 950 955 960

Arg Tyr Lys Leu Val Lys Asn Asp Gly Glu Phe Arg Leu His Asn Pro
965 970 975

Ile Lys Glu Gln Glu Leu His Asn Asp Leu Val Arg Ala Glu Gln Ala
980 985 990

Glu Arg Thr Leu Glu Ala Lys Gln Val Glu Pro Thr Ala Lys Thr Gln
995 1000 1005

Thr Gly Glu Pro Lys Val Arg Ser Arg Arg Ala Ala Arg Ala Ala
1010 1015 1020

Phe Pro Asp Thr Leu Pro Asp Gln Ser Leu Leu Asn Ala Leu Glu
1025 1030 1035

Ala Lys Gln Ala Glu Leu Thr Ala Glu Thr Gln Lys Ser Lys Ala
1040 1045 1050

Lys Thr Lys Lys Val Arg Ser Lys Arg Ala Val Phe Ser Asp Pro
1055 1060 1065

Leu Leu Asp Gln Ser Leu Phe Ala Leu Glu Ala Ala Leu Glu Val
1070 1075 1080

Ile Asp Ala Pro Gln Gln Ser Glu Lys Asp Arg Leu Ala Gln Glu
1085 1090 1095

Glu Ala Glu Lys Gln Arg Lys Gln Lys Asp Leu Ile Ser Arg Tyr
1100 1105 1110

Ser Asn Ser Ala Leu Ser Glu Leu Ser Ala Thr Val Asn Ser Met
1115 1120 1125

Leu Ser Val Gln Asp Glu Leu Asp Arg Leu Phe Val Asp Gln Ala
1130 1135 1140

Gln Ser Ala Val Trp Thr Asn Ile Ala Gln Asp Lys Arg Arg Tyr
1145 1150 1155

Asp Ser Asp Ala Phe Arg Ala Tyr Gln Gln Lys Thr Asn Leu
1160 1165 1170

Arg Gln Ile Gly Val Gln Lys Ala Leu Ala Asn Gly Arg Ile Gly
1175 1180 1185

Ala Val Phe Ser His Ser Arg Ser Asp Asn Thr Phe Asp Glu Gln
1190 1195 1200

Val Lys Asn His Ala Thr Leu Thr Met Met Ser Gly Phe Ala Gln
1205 1210 1215

Tyr Gln Trp Gly Asp Leu Gln Phe Gly Val Asn Val Gly Thr Gly
1220 1225 1230

Ile Ser Ala Ser Lys Met Ala Glu Glu Gln Ser Arg Lys Ile His
1235 1240 1245

Arg Lys Ala Ile Asn Tyr Gly Val Asn Ala Ser Tyr Gln Phe Arg
1250 1255 1260

Leu Gly Gln Leu Gly Ile Gln Pro Tyr Phe Gly Val Asn Arg Tyr
1265 1270 1275

Phe Ile Glu Arg Glu Asn Tyr Gln Ser Glu Glu Val Arg Val Lys
1280 1285 1290

Thr Pro Ser Leu Ala Phe Asn Arg Tyr Asn Ala Gly Ile Arg Val
1295 1300 1305

Asp Tyr Thr Phe Thr Pro Thr Asp Asn Ile Ser Val Lys Pro Tyr
1310 1315 1320

Phe Phe Val Asn Tyr Val Asp Val Ser Asn Ala Asn Val Gln Thr
1325 1330 1335

Thr Val Asn Leu Thr Val Leu Gln Gln Pro Phe Gly Arg Tyr Trp

1340

1345

1350

Gln Lys Glu Val Gly Leu Lys Ala Glu Ile Leu His Phe Gln Ile
1355 1360 1365

Ser Ala Phe Ile Ser Lys Ser Gln Gly Ser Gln Leu Gly Lys Gln
1370 1375 1380

Gln Asn Val Gly Val Lys Leu Gly Tyr Arg Trp
1385 1390

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<400> 3

Met Leu Asn Lys Lys Phe Lys Leu Asn Phe Ile Ala Leu Thr Val Ala
1 5 10 15

Tyr Ala Leu Thr Pro Tyr Thr Glu Ala Ala Leu Val Arg Asp Asp Val
20 25 30

Asp Tyr Gln Ile Phe Arg Asp Phe Ala Glu Asn Lys Gly Lys Phe Ser
35 40 45

Val Gly Ala Thr Asn Val Leu Val Lys Asp Lys Asn Asn Lys Asp Leu
50 55 60

Gly Thr Ala Leu Pro Asn Gly Ile Pro Met Ile Asp Phe Ser Val Val
65 70 75 80

Asp Val Asp Lys Arg Ile Ala Thr Leu Ile Asn Pro Gln Tyr Val Val
85 90 95

Gly Val Lys His Val Ser Asn Gly Val Ser Glu Leu His Phe Gly Asn
100 105 110

Leu Asn Gly Asn Met Asn Asn Gly Asn Ala Lys Ala His Arg Asp Val
115 120 125

Ser Ser Glu Glu Asn Arg Tyr Phe Ser Val Glu Lys Asn Glu Tyr Pro
130 135 140

Thr Lys Leu Asn Gly Lys Thr Val Thr Glu Asp Gln Thr Gln Lys
145 150 155 160

Arg Arg Glu Asp Tyr Tyr Met Pro Arg Leu Asp Lys Phe Val Thr Glu
165 170 175

Val Ala Pro Ile Glu Ala Ser Thr Ala Ser Ser Asp Ala Gly Thr Tyr
180 185 190

Asn Asp Gln Asn Lys Tyr Pro Ala Phe Val Arg Leu Gly Ser Gly Ser
195 200 205

Gln Phe Ile Tyr Lys Lys Gly Asp Asn Tyr Ser Leu Ile Leu Asn Asn
210 215 220

His Glu Val Gly Gly Asn Asn Leu Lys Leu Val Gly Asp Ala Tyr Thr
225 230 235 240

Tyr Gly Ile Ala Gly Thr Pro Tyr Lys Val Asn His Glu Asn Asn Gly
245 250 255

Leu Ile Gly Phe Gly Asn Ser Lys Glu Glu His Ser Asp Pro Lys Gly
260 265 270

Ile Leu Ser Gln Asp Pro Leu Thr Asn Tyr Ala Val Leu Gly Asp Ser
275 280 285

Gly Ser Pro Leu Phe Val Tyr Asp Arg Glu Lys Gly Lys Trp Leu Phe
290 295 300

Leu Gly Ser Tyr Asp Phe Trp Ala Gly Tyr Asn Lys Lys Ser Trp Gln
305 310 315 320

Glu Trp Asn Ile Tyr Lys Ser Gln Phe Thr Lys Asp Val Leu Asn Lys
325 330 335

Asp Ser Ala Gly Ser Leu Ile Gly Ser Lys Thr Asp Tyr Ser Trp Ser
340 345 350

Ser Asn Gly Lys Thr Ser Thr Ile Thr Gly Gly Glu Lys Ser Leu Asn
355 360 365

Val Asp Leu Ala Asp Gly Lys Asp Lys Pro Asn His Gly Lys Ser Val
370 375 380

Thr Phe Glu Gly Ser Gly Thr Leu Thr Leu Asn Asn Asn Ile Asp Gln
385 390 395 400

Gly Ala Gly Gly Leu Phe Phe Glu Gly Asp Tyr Glu Val Lys Gly Thr
405 410 415

Ser Asp Asn Thr Thr Trp Lys Gly Ala Gly Val Ser Val Ala Glu Gly
420 425 430

Lys Thr Val Thr Trp Lys Val His Asn Pro Gln Tyr Asp Arg Leu Ala
435 440 445

Lys Ile Gly Lys Gly Thr Leu Ile Val Glu Gly Thr Gly Asp Asn Lys
450 455 460

Gly Ser Leu Lys Val Gly Asp Gly Thr Val Ile Leu Lys Gln Gln Thr
465 470 475 480

Asn Gly Ser Gly Gln His Ala Phe Ala Ser Val Gly Ile Val Ser Gly
485 490 495

Arg Ser Thr Leu Val Leu Asn Asp Asp Lys Gln Val Asp Pro Asn Ser
500 505 510

Ile Tyr Phe Gly Phe Arg Gly Arg Leu Asp Leu Asn Gly Asn Ser
515 520 525

Leu Thr Phe Asp His Ile Arg Asn Ile Asp Asp Gly Ala Arg Leu Val
530 535 540

Asn His Asn Met Thr Asn Ala Ser Asn Ile Thr Ile Thr Gly Glu Ser
545 550 555 560

Leu Ile Thr Asp Pro Asn Thr Ile Thr Pro Tyr Asn Ile Asp Ala Pro
565 570 575

Asp Glu Asp Asn Pro Tyr Ala Phe Arg Arg Ile Lys Asp Gly Gly Gln
580 585 590

Leu Tyr Leu Asn Leu Glu Asn Tyr Thr Tyr Tyr Ala Leu Arg Lys Gly

595

600

605

Ala Ser Thr Arg Ser Glu Leu Pro Lys Asn Ser Gly Glu Ser Asn Glu
610 615 620

Asn Trp Leu Tyr Met Gly Lys Thr Ser Asp Glu Ala Lys Arg Asn Val
625 630 635 640

Met Asn His Ile Asn Asn Glu Arg Met Asn Gly Phe Asn Gly Tyr Phe
645 650 655

Gly Glu Glu Glu Gly Lys Asn Asn Gly Asn Leu Asn Val Thr Phe Lys
660 665 670

Gly Lys Ser Glu Gln Asn Arg Phe Leu Leu Thr Gly Gly Thr Asn Leu
675 680 685

Asn Gly Asp Leu Thr Val Glu Lys Gly Thr Leu Phe Leu Ser Gly Arg
690 695 700

Pro Thr Pro His Ala Arg Asp Ile Ala Gly Ile Ser Ser Thr Lys Lys
705 710 715 720

Asp Pro His Phe Ala Glu Asn Asn Glu Val Val Val Glu Asp Asp Trp
725 730 735

Ile Asn Arg Asn Phe Lys Ala Thr Thr Met Asn Val Thr Gly Asn Ala
740 745 750

Ser Leu Tyr Ser Gly Arg Asn Val Ala Asn Ile Thr Ser Asn Ile Thr
755 760 765

Ala Ser Asn Lys Ala Gln Val His Ile Gly Tyr Lys Thr Gly Asp Thr
770 775 780

Val Cys Val Arg Ser Asp Tyr Thr Gly Tyr Val Thr Cys Thr Thr Asp
785 790 795 800

Lys Leu Ser Asp Lys Ala Leu Asn Ser Phe Asn Pro Thr Asn Leu Arg
805 810 815

Gly Asn Val Asn Leu Thr Glu Ser Ala Asn Phe Val Leu Gly Lys Ala
820 825 830

Asn Leu Phe Gly Thr Ile Gln Ser Arg Gly Asn Ser Gln Val Arg Leu
835 840 845

Thr Glu Asn Ser His Trp His Leu Thr Gly Asn Ser Asp Val His Gln
850 855 860

Leu Asp Leu Ala Asn Gly His Ile His Leu Asn Ser Ala Asp Asn Ser
865 870 875 880

Asn Asn Val Thr Lys Tyr Asn Thr Leu Thr Val Asn Ser Leu Ser Gly
885 890 895

Asn Gly Ser Phe Tyr Tyr Leu Thr Asp Leu Ser Asn Lys Gln Gly Asp
900 905 910

Lys Val Val Val Thr Lys Ser Ala Thr Gly Asn Phe Thr Leu Gln Val
915 920 925

Ala Asp Lys Thr Gly Glu Pro Asn His Asn Glu Leu Thr Leu Phe Asp
930 935 940

Ala Ser Lys Ala Gln Arg Asp His Leu Asn Val Ser Leu Val Gly Asn
945 950 955 960

Thr Val Asp Leu Gly Ala Trp Lys Tyr Lys Leu Arg Asn Val Asn Gly
965 970 975

Arg Tyr Asp Leu Tyr Asn Pro Glu Val Glu Lys Arg Asn Gln Thr Val
980 985 990

Asp Thr Thr Asn Ile Thr Thr Pro Asn Asn Ile Gln Ala Asp Val Pro
995 1000 1005

Ser Val Pro Ser Asn Asn Glu Glu Ile Ala Arg Val Asp Glu Ala
1010 1015 1020

Pro Val Pro Pro Pro Ala Pro Ala Thr Pro Ser Glu Thr Thr Glu
1025 1030 1035

Thr Val Ala Glu Asn Ser Lys Gln Glu Ser Lys Thr Val Glu Lys
1040 1045 1050

Asn Glu Gln Asp Ala Thr Glu Thr Thr Ala Gln Asn Arg Glu Val
1055 1060 1065

Ala Lys Glu Ala Lys Ser Asn Val Lys Ala Asn Thr Gln Thr Asn
1070 1075 1080

Glu Val Ala Gln Ser Gly Ser Glu Thr Lys Glu Thr Gln Thr Thr
1085 1090 1095

Glu Thr Lys Glu Thr Ala Thr Val Glu Lys Glu Glu Lys Ala Lys
1100 1105 1110

Val Glu Thr Glu Lys Thr Gln Glu Val Pro Lys Val Thr Ser Gln
1115 1120 1125

Val Ser Pro Lys Gln Glu Gln Ser Glu Thr Val Gln Pro Gln Ala
1130 1135 1140

Glu Pro Ala Arg Glu Asn Asp Pro Thr Val Asn Ile Lys Glu Pro
1145 1150 1155

Gln Ser Gln Thr Asn Thr Ala Asp Thr Glu Gln Pro Ala Lys
1160 1165 1170

Glu Thr Ser Ser Asn Val Glu Gln Pro Val Thr Glu Ser Thr Thr
1175 1180 1185

Val Asn Thr Gly Asn Ser Val Val Glu Asn Pro Glu Asn Thr Thr
1190 1195 1200

Pro Ala Thr Thr Gln Pro Thr Val Asn Ser Glu Ser Ser Asn Lys
1205 1210 1215

Pro Lys Asn Arg His Arg Arg Ser Val Arg Ser Val Pro His Asn
1220 1225 1230

Val Glu Pro Ala Thr Thr Ser Ser Asn Asp Arg Ser Thr Val Ala
1235 1240 1245

Leu Cys Asp Leu Thr Ser Thr Asn Thr Asn Ala Val Leu Ser Asp
1250 1255 1260

Ala Arg Ala Lys Ala Gln Phe Val Ala Leu Asn Val Gly Lys Ala
1265 1270 1275

Val Ser Gln His Ile Ser Gln Leu Glu Met Asn Asn Glu Gly Gln
1280 1285 1290

Tyr Asn Val Trp Val Ser Asn Thr Ser Met Asn Lys Asn Tyr Ser
1295 1300 1305

Ser Ser Gln Tyr Arg Arg Phe Ser Ser Lys Ser Thr Gln Thr Gln
1310 1315 1320

Leu Gly Trp Asp Gln Thr Ile Ser Asn Asn Val Gln Leu Gly Gly
1325 1330 1335

Val Phe Thr Tyr Val Arg Asn Ser Asn Asn Phe Asp Lys Ala Thr
1340 1345 1350

Ser Lys Asn Thr Leu Ala Gln Val Asn Phe Tyr Ser Lys Tyr Tyr
1355 1360 1365

Ala Asp Asn His Trp Tyr Leu Gly Ile Asp Leu Gly Tyr Gly Lys
1370 1375 1380

Phe Gln Ser Lys Leu Gln Thr Asn His Asn Ala Lys Phe Ala Arg
1385 1390 1395

His Thr Ala Gln Phe Gly Leu Thr Ala Gly Lys Ala Phe Asn Leu
1400 1405 1410

Gly Asn Phe Gly Ile Thr Pro Ile Val Gly Val Arg Tyr Ser Tyr
1415 1420 1425

Leu Ser Asn Ala Asp Phe Ala Leu Asp Gln Ala Arg Ile Lys Val
1430 1435 1440

Asn Pro Ile Ser Val Lys Thr Ala Phe Ala Gln Val Asp Leu Ser
1445 1450 1455

Tyr Thr Tyr His Leu Gly Glu Phe Ser Val Thr Pro Ile Leu Ser
1460 1465 1470

Ala Arg Tyr Asp Ala Asn Gln Gly Ser Gly Lys Ile Asn Val Asn

1475

1480

1485

Gly Tyr Asp Phe Ala Tyr Asn Val Glu Asn Gln Gln Gln Tyr Asn
1490 1495 1500

Ala Gly Leu Lys Leu Lys Tyr His Asn Val Lys Leu Ser Leu Ile
1505 1510 1515

Gly Gly Leu Thr Lys Ala Lys Gln Ala Glu Lys Gln Lys Thr Ala
1520 1525 1530

Glu Leu Lys Leu Ser Phe Ser Phe
1535 1540

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<213> Haemophilus influenzae

<400> 4

Met Leu Asn Lys Lys Phe Lys Leu Asn Phe Ile Ala Leu Thr Val Ala
1 5 10 15

Tyr Ala Leu Thr Pro Tyr Thr Glu Ala Ala Leu Val Arg Asp Asp Val
20 25 30

Asp Tyr Gln Ile Phe Arg Asp Phe Ala Glu Asn Lys Gly Lys Phe Ser
35 40 45

Val Gly Ala Thr Asn Val Glu Val Arg Asp Lys Asn Asn Arg Pro Leu
50 55 60

Gly Asn Val Leu Pro Asn Gly Ile Pro Met Ile Asp Phe Ser Val Val
65 70 75 80

Asp Val Asp Lys Arg Ile Ala Thr Leu Val Asn Pro Gln Tyr Val Val
85 90 95

Gly Val Lys His Val Ser Asn Gly Val Ser Glu Leu His Phe Gly Asn
100 105 110

Leu Asn Gly Asn Met Asn Asn Gly Asn Ala Lys Ala His Arg Asp Val
115 120 125

Ser Ser Glu Glu Asn Arg Tyr Tyr Thr Val Glu Lys Asn Glu Tyr Pro
130 135 140

Thr Lys Leu Asn Gly Lys Ala Val Thr Thr Glu Asp Gln Ala Gln Lys
145 150 155 160

Arg Arg Glu Asp Tyr Tyr Met Pro Arg Leu Asp Lys Phe Val Thr Glu
165 170 175

Val Ala Pro Ile Glu Ala Ser Thr Asp Ser Ser Thr Ala Gly Thr Tyr
180 185 190

Asn Asn Lys Asp Lys Tyr Pro Tyr Phe Val Arg Leu Gly Ser Gly Thr
195 200 205

Gln Phe Ile Tyr Glu Asn Gly Thr Arg Tyr Glu Leu Trp Leu Gly Lys
210 215 220

Glu Gly Gln Lys Ser Asp Ala Gly Gly Tyr Asn Leu Lys Leu Val Gly
225 230 235 240

Asn Ala Tyr Thr Tyr Gly Ile Ala Gly Thr Pro Tyr Glu Val Asn His
245 250 255

Glu Asn Asp Gly Leu Ile Gly Phe Gly Asn Ser Asn Asn Glu Tyr Ile
260 265 270

Asn Pro Lys Glu Ile Leu Ser Lys Lys Pro Leu Thr Asn Tyr Ala Val
275 280 285

Leu Gly Asp Ser Gly Ser Pro Leu Phe Val Tyr Asp Arg Glu Lys Gly
290 295 300

Lys Trp Leu Phe Leu Gly Ser Tyr Asp Tyr Trp Ala Gly Tyr Asn Lys
305 310 315 320

Lys Ser Trp Gln Glu Trp Asn Ile Tyr Lys Pro Glu Phe Ala Glu Lys
325 330 335

Ile Tyr Glu Gln Tyr Ser Ala Gly Ser Leu Ile Gly Ser Lys Thr Asp
340 345 350

Tyr Ser Trp Ser Ser Asn Gly Lys Thr Ser Thr Ile Thr Gly Gly Glu
355 360 365

Lys Ser Leu Asn Val Asp Leu Ala Asp Gly Lys Asp Lys Pro Asn His
370 375 380

Gly Lys Ser Val Thr Phe Glu Gly Ser Gly Thr Leu Thr Leu Asn Asn
385 390 395 400

Asn Ile Asp Gln Gly Ala Gly Gly Leu Phe Phe Glu Gly Asp Tyr Glu
405 410 415

Val Lys Gly Thr Ser Asp Asn Thr Thr Trp Lys Gly Ala Gly Val Ser
420 425 430

Val Ala Glu Gly Lys Thr Val Thr Trp Lys Val His Asn Pro Gln Tyr
435 440 445

Asp Arg Leu Ala Lys Ile Gly Lys Gly Thr Leu Ile Val Glu Gly Thr
450 455 460

Gly Asp Asn Lys Gly Ser Leu Lys Val Gly Asp Gly Thr Val Ile Leu
465 470 475 480

Lys Gln Gln Thr Asn Gly Ser Gly Gln His Ala Phe Ala Ser Val Gly
485 490 495

Ile Val Ser Gly Arg Ser Thr Leu Val Leu Asn Asp Asp Lys Gln Val
500 505 510

Asp Pro Asn Ser Ile Tyr Phe Gly Phe Arg Gly Arg Leu Asp Leu
515 520 525

Asn Gly Asn Ser Leu Thr Phe Asp His Ile Arg Asn Ile Asp Glu Gly
530 535 540

Ala Arg Leu Val Asn His Ser Thr Ser Lys His Ser Thr Val Thr Ile
545 550 555 560

Thr Gly Asp Asn Leu Ile Thr Asp Pro Asn Asn Val Ser Ile Tyr Tyr
565 570 575

Val Lys Pro Leu Glu Asp Asp Asn Pro Tyr Ala Ile Arg Gln Ile Lys

580

585

590

Tyr Gly Tyr Gln Leu Tyr Phe Asn Glu Glu Asn Arg Thr Tyr Tyr Ala
595 600 605

Leu Lys Lys Asp Ala Ser Ile Arg Ser Glu Phe Pro Gln Asn Arg Gly
610 615 620

Glu Ser Asn Asn Ser Trp Leu Tyr Met Gly Thr Glu Lys Ala Asp Ala
625 630 635 640

Gln Lys Asn Ala Met Asn His Ile Asn Asn Glu Arg Met Asn Gly Phe
645 650 655

Asn Gly Tyr Phe Gly Glu Glu Gly Lys Asn Asn Gly Asn Leu Asn
660 665 670

Val Thr Phe Lys Gly Lys Ser Glu Gln Asn Arg Phe Leu Leu Thr Gly
675 680 685

Gly Thr Asn Leu Asn Gly Asp Leu Asn Val Gln Gln Gly Thr Leu Phe
690 695 700

Leu Ser Gly Arg Pro Thr Pro His Ala Arg Asp Ile Ala Gly Ile Ser
705 710 715 720

Ser Thr Lys Lys Asp Ser His Phe Ser Glu Asn Asn Glu Val Val Val
725 730 735

Glu Asp Asp Trp Ile Asn Arg Asn Phe Lys Ala Thr Asn Ile Asn Val
740 745 750

Thr Asn Asn Ala Thr Leu Tyr Ser Gly Arg Asn Val Glu Ser Ile Thr
755 760 765

Ser Asn Ile Thr Ala Ser Asn Asn Ala Lys Val His Ile Gly Tyr Lys
770 775 780

Ala Gly Asp Thr Val Cys Val Arg Ser Asp Tyr Thr Gly Tyr Val Thr
785 790 795 800

Cys Thr Thr Asp Lys Leu Ser Asp Lys Ala Leu Asn Ser Phe Asn Pro
805 810 815

Thr Asn Leu Arg Gly Asn Val Asn Leu Thr Glu Ser Ala Asn Phe Val
820 825 830

Leu Gly Lys Ala Asn Leu Phe Gly Thr Ile Gln Ser Arg Gly Asn Ser
835 840 845

Gln Val Arg Leu Thr Glu Asn Ser His Trp His Leu Thr Gly Asn Ser
850 855 860

Asp Val His Gln Leu Asp Leu Ala Asn Gly His Ile His Leu Asn Ser
865 870 875 880

Ala Asp Asn Ser Asn Asn Val Thr Lys Tyr Asn Thr Leu Thr Val Asn
885 890 895

Ser Leu Ser Gly Asn Gly Ser Phe Tyr Tyr Leu Thr Asp Leu Ser Asn
900 905 910

Lys Gln Gly Asp Lys Val Val Val Thr Lys Ser Ala Thr Gly Asn Phe
915 920 925

Thr Leu Gln Val Ala Asp Lys Thr Gly Glu Pro Asn His Asn Glu Leu
930 935 940

Thr Leu Phe Asp Ala Ser Lys Ala Gln Arg Asp His Leu Asn Val Ser
945 950 955 960

Leu Val Gly Asn Thr Val Asp Leu Gly Ala Trp Lys Tyr Lys Leu Arg
965 970 975

Asn Val Asn Gly Arg Tyr Asp Leu Tyr Asn Pro Glu Val Glu Lys Arg
980 985 990

Asn Gln Thr Val Asp Thr Thr Asn Ile Thr Thr Pro Asn Asn Ile Gln
995 1000 1005

Ala Asp Val Pro Ser Val Pro Ser Asn Asn Glu Glu Ile Ala Arg
1010 1015 1020

Val Asp Glu Ala Pro Val Pro Pro Pro Ala Pro Ala Thr Pro Ser
1025 1030 1035

Glu Thr Thr Glu Thr Val Ala Glu Asn Ser Lys Gln Glu Ser Lys
1040 1045 1050

Thr Val Glu Lys Asn Glu Gln Asp Ala Thr Glu Thr Thr Ala Gln
1055 1060 1065

Asn Arg Glu Val Ala Lys Glu Ala Lys Ser Asn Val Lys Ala Asn
1070 1075 1080

Thr Gln Thr Asn Glu Val Ala Gln Ser Gly Ser Glu Thr Lys Glu
1085 1090 1095

Thr Gln Thr Thr Glu Thr Lys Glu Thr Ala Thr Val Glu Lys Glu
1100 1105 1110

Glu Lys Ala Lys Val Glu Thr Glu Lys Thr Gln Glu Val Pro Lys
1115 1120 1125

Val Thr Ser Gln Val Ser Pro Lys Gln Glu Gln Ser Glu Thr Val
1130 1135 1140

Gln Pro Gln Ala Glu Pro Ala Arg Glu Asn Asp Pro Thr Val Asn
1145 1150 1155

Ile Lys Glu Pro Gln Ser Gln Thr Asn Thr Thr Ala Asp Thr Glu
1160 1165 1170

Gln Pro Ala Lys Glu Thr Ser Ser Asn Val Glu Gln Pro Val Thr
1175 1180 1185

Glu Ser Thr Thr Val Asn Thr Gly Asn Ser Val Val Glu Asn Pro
1190 1195 1200

Glu Asn Thr Thr Pro Ala Thr Thr Gln Pro Thr Val Asn Ser Glu
1205 1210 1215

Ser Ser Asn Lys Pro Lys Asn Arg His Arg Arg Ser Val Arg Ser
1220 1225 1230

Val Pro His Asn Val Glu Pro Ala Thr Thr Ser Ser Asn Asp Arg
1235 1240 1245

Ser Thr Val Ala Leu Cys Asp Leu Thr Ser Thr Asn Thr Asn Ala
1250 1255 1260

Val Leu Ser Asp Ala Arg Ala Lys Ala Gln Phe Val Ala Leu Asn
1265 1270 1275

Val Gly Lys Ala Val Ser Gln His Ile Ser Gln Leu Glu Met Asn
1280 1285 1290

Asn Glu Gly Gln Tyr Asn Val Trp Val Ser Asn Thr Ser Met Asn
1295 1300 1305

Lys Asn Tyr Ser Ser Ser Gln Tyr Arg Arg Phe Ser Ser Lys Ser
1310 1315 1320

Thr Gln Thr Gln Leu Gly Trp Asp Gln Thr Ile Ser Asn Asn Val
1325 1330 1335

Gln Leu Gly Gly Val Phe Thr Tyr Val Arg Asn Ser Asn Asn Phe
1340 1345 1350

Asp Lys Ala Thr Ser Lys Asn Thr Leu Ala Gln Val Asn Phe Tyr
1355 1360 1365

Ser Lys Tyr Tyr Ala Asp Asn His Trp Tyr Leu Gly Ile Asp Leu
1370 1375 1380

Gly Tyr Gly Lys Phe Gln Ser Lys Leu Gln Thr Asn His Asn Ala
1385 1390 1395

Lys Phe Ala Arg His Thr Ala Gln Phe Gly Leu Thr Ala Gly Lys
1400 1405 1410

Ala Phe Asn Leu Gly Asn Phe Gly Ile Thr Pro Ile Val Gly Val
1415 1420 1425

Arg Tyr Ser Tyr Leu Ser Asn Ala Asp Phe Ala Leu Asp Gln Ala
1430 1435 1440

Arg Ile Lys Val Asn Pro Ile Ser Val Lys Thr Ala Phe Ala Gln
1445 1450 1455

Val Asp Leu Ser Tyr Thr Tyr His Leu Gly Glu Phe Ser Val Thr

1460

1465

1470

Pro Ile Leu Ser Ala Arg Tyr Asp Ala Asn Gln Gly Ser Gly Lys
1475 1480 1485

Ile Asn Val Asn Gly Tyr Asp Phe Ala Tyr Asn Val Glu Asn Gln
1490 1495 1500

Gln Gln Tyr Asn Ala Gly Leu Lys Leu Lys Tyr His Asn Val Lys
1505 1510 1515

Leu Ser Leu Ile Gly Gly Leu Thr Lys Ala Lys Gln Ala Glu Lys
1520 1525 1530

Gln Lys Thr Ala Glu Leu Lys Leu Ser Phe Ser Phe
1535 1540 1545

<210> 5
<211> 1702
<212> PRT
<213> Haemophilus influenzae

<400> 5

Met Leu Asn Lys Lys Phe Lys Leu Asn Phe Ile Ala Leu Thr Val Ala
1 5 10 15

Tyr Ala Leu Thr Pro Tyr Thr Glu Ala Ala Leu Val Arg Asp Asp Val
20 25 30

Asp Tyr Gln Ile Phe Arg Asp Phe Ala Glu Asn Lys Gly Arg Phe Ser
35 40 45

Val Gly Ala Thr Asn Val Glu Val Arg Asp Lys Asn Asn His Ser Leu
50 55 60

Gly Asn Val Leu Pro Asn Gly Ile Pro Met Ile Asp Phe Ser Val Val
65 70 75 80

Asp Val Asp Lys Arg Ile Ala Thr Leu Ile Asn Pro Gln Tyr Val Val
85 90 95

Gly Val Lys His Val Ser Asn Gly Val Ser Glu Leu His Phe Gly Asn
100 105 110

Leu Asn Gly Asn Met Asn Asn Gly Asn Asp Lys Ser His Arg Asp Val
115 120 125

Ser Ser Glu Glu Asn Arg Tyr Phe Ser Val Glu Lys Asn Glu Tyr Pro
130 135 140

Thr Lys Leu Asn Gly Lys Ala Val Thr Thr Glu Asp Gln Thr Gln Lys
145 150 155 160

Arg Arg Glu Asp Tyr Tyr Met Pro Arg Leu Asp Lys Phe Val Thr Glu
165 170 175

Val Ala Pro Ile Glu Ala Ser Thr Ala Ser Ser Asp Ala Gly Thr Tyr
180 185 190

Asn Asp Gln Asn Lys Tyr Pro Ala Phe Val Arg Leu Gly Ser Gly Thr
195 200 205

Gln Phe Ile Tyr Lys Lys Gly Asp Asn Tyr Ser Leu Ile Leu Asn Asn
210 215 220

His Glu Val Gly Gly Asn Asn Leu Lys Leu Val Gly Asp Ala Tyr Thr
225 230 235 240

Tyr Gly Ile Ala Gly Thr Pro Tyr Lys Val Asn His Glu Asn Asn Gly
245 250 255

Leu Ile Gly Phe Gly Asn Ser Lys Glu Glu His Ser Asp Pro Lys Gly
260 265 270

Ile Leu Ser Gln Asp Pro Leu Thr Asn Tyr Ala Val Leu Gly Asp Ser
275 280 285

Gly Ser Pro Leu Phe Val Tyr Asp Arg Glu Lys Gly Lys Trp Leu Phe
290 295 300

Leu Gly Ser Tyr Asp Phe Trp Ala Gly Tyr Asn Lys Lys Ser Trp Gln
305 310 315 320

Glu Trp Asn Ile Tyr Lys Pro Glu Phe Ala Lys Thr Val Leu Asp Lys
325 330 335

Asp Thr Ala Gly Ser Leu Ile Gly Ser Asn Thr Gln Tyr Asn Trp Asn
340 345 350

Pro Thr Gly Lys Thr Ser Val Ile Ser Asn Gly Ser Glu Ser Leu Asn
355 360 365

Val Asp Leu Phe Asp Ser Ser Gln Asp Thr Asp Ser Lys Lys Asn Asn
370 375 380

His Gly Lys Ser Val Thr Leu Arg Gly Ser Gly Thr Leu Thr Leu Asn
385 390 395 400

Asn Asn Ile Asp Gln Gly Ala Gly Gly Leu Phe Phe Glu Gly Asp Tyr
405 410 415

Glu Val Lys Gly Thr Ser Asp Ser Thr Thr Trp Lys Gly Ala Gly Val
420 425 430

Ser Val Ala Asp Gly Lys Thr Val Thr Trp Lys Val His Asn Pro Lys
435 440 445

Ser Asp Arg Leu Ala Lys Ile Gly Lys Gly Thr Leu Ile Val Glu Gly
450 455 460

Lys Gly Glu Asn Lys Gly Ser Leu Lys Val Gly Asp Gly Thr Val Ile
465 470 475 480

Leu Lys Gln Gln Ala Asp Ala Asn Asn Lys Val Lys Ala Phe Ser Gln
485 490 495

Val Gly Ile Val Ser Gly Arg Ser Thr Val Val Leu Asn Asp Asp Lys
500 505 510

Gln Val Asp Pro Asn Ser Ile Tyr Phe Gly Phe Arg Gly Arg Leu
515 520 525

Asp Ala Asn Gly Asn Asn Leu Thr Phe Glu His Ile Arg Asn Ile Asp
530 535 540

Asp Gly Ala Arg Leu Val Asn His Asn Thr Ser Lys Thr Ser Thr Val
545 550 555 560

Thr Ile Thr Gly Glu Ser Leu Ile Thr Asp Pro Asn Thr Ile Thr Pro

565

570

575

Tyr Asn Ile Asp Ala Pro Asp Glu Asp Asn Pro Tyr Ala Phe Arg Arg
580 585 590

Ile Lys Asp Gly Gly Gln Leu Tyr Leu Asn Leu Glu Asn Tyr Thr Tyr
595 600 605

Tyr Ala Leu Arg Lys Gly Ala Ser Thr Arg Ser Glu Leu Pro Lys Asn
610 615 620

Ser Gly Glu Ser Asn Glu Asn Trp Leu Tyr Met Gly Lys Thr Ser Asp
625 630 635 640

Ala Ala Lys Arg Asn Val Met Asn His Ile Asn Asn Glu Arg Met Asn
645 650 655

Gly Phe Asn Gly Tyr Phe Gly Glu Glu Gly Lys Asn Asn Gly Asn
660 665 670

Leu Asn Val Thr Phe Lys Gly Lys Ser Glu Gln Asn Arg Phe Leu Leu
675 680 685

Thr Gly Gly Thr Asn Leu Asn Gly Asp Leu Lys Val Glu Lys Gly Thr
690 695 700

Leu Phe Leu Ser Gly Arg Pro Thr Pro His Ala Arg Asp Ile Ala Gly
705 710 715 720

Ile Ser Ser Thr Lys Lys Asp Gln His Phe Ala Glu Asn Asn Glu Val
725 730 735

Val Val Glu Asp Asp Trp Ile Asn Arg Asn Phe Lys Ala Thr Asn Ile
740 745 750

Asn Val Thr Asn Asn Ala Thr Leu Tyr Ser Gly Arg Asn Val Ala Asn
755 760 765

Ile Thr Ser Asn Ile Thr Ala Ser Asp Asn Ala Lys Val His Ile Gly
770 775 780

Tyr Lys Ala Gly Asp Thr Val Cys Val Arg Ser Asp Tyr Thr Gly Tyr
785 790 795 800

Val Thr Cys Thr Thr Asp Lys Leu Ser Asp Lys Ala Leu Asn Ser Phe
805 810 815

Asn Ala Thr Asn Val Ser Gly Asn Val Asn Leu Ser Gly Asn Ala Asn
820 825 830

Phe Val Leu Gly Lys Ala Asn Leu Phe Gly Thr Ile Ser Gly Thr Gly
835 840 845

Asn Ser Gln Val Arg Leu Thr Glu Asn Ser His Trp His Leu Thr Gly
850 855 860

Asp Ser Asn Val Asn Gln Leu Asn Leu Asp Lys Gly His Ile His Leu
865 870 875 880

Asn Ala Gln Asn Asp Ala Asn Lys Val Thr Thr Tyr Asn Thr Leu Thr
885 890 895

Val Asn Ser Leu Ser Gly Asn Gly Ser Phe Tyr Tyr Leu Thr Asp Leu
900 905 910

Ser Asn Lys Gln Gly Asp Lys Val Val Val Thr Lys Ser Ala Thr Gly
915 920 925

Asn Phe Thr Leu Gln Val Ala Asp Lys Thr Gly Glu Pro Thr Lys Asn
930 935 940

Glu Leu Thr Leu Phe Asp Ala Ser Asn Ala Thr Arg Asn Asn Leu Asn
945 950 955 960

Val Ser Leu Val Gly Asn Thr Val Asp Leu Gly Ala Trp Lys Tyr Lys
965 970 975

Leu Arg Asn Val Asn Gly Arg Tyr Asp Leu Tyr Asn Pro Glu Val Glu
980 985 990

Lys Arg Asn Gln Thr Val Asp Thr Thr Asn Ile Thr Thr Pro Asn Asn
995 1000 1005

Ile Gln Ala Asp Val Pro Ser Val Pro Ser Asn Asn Glu Glu Ile
1010 1015 1020

Ala Arg Val Glu Thr Pro Val Pro Pro Pro Ala Pro Ala Thr Pro
1025 1030 1035

Ser Glu Thr Thr Glu Thr Val Ala Glu Asn Ser Lys Gln Glu Ser
1040 1045 1050

Lys Thr Val Glu Lys Asn Glu Gln Asp Ala Thr Glu Thr Thr Ala
1055 1060 1065

Gln Asn Gly Glu Val Ala Glu Glu Ala Lys Pro Ser Val Lys Ala
1070 1075 1080

Asn Thr Gln Thr Asn Glu Val Ala Gln Ser Gly Ser Glu Thr Glu
1085 1090 1095

Glu Thr Gln Thr Thr Glu Ile Lys Glu Thr Ala Lys Val Glu Lys
1100 1105 1110

Glu Glu Lys Ala Lys Val Glu Lys Glu Glu Lys Ala Lys Val Glu
1115 1120 1125

Lys Asp Glu Ile Gln Glu Ala Pro Gln Met Ala Ser Glu Thr Ser
1130 1135 1140

Pro Lys Gln Ala Lys Pro Ala Pro Lys Glu Val Ser Thr Asp Thr
1145 1150 1155

Lys Val Glu Glu Thr Gln Val Gln Ala Gln Pro Gln Thr Gln Ser
1160 1165 1170

Thr Thr Val Ala Ala Ala Glu Ala Thr Ser Pro Asn Ser Lys Pro
1175 1180 1185

Ala Glu Glu Thr Gln Pro Ser Glu Lys Thr Asn Ala Glu Pro Val
1190 1195 1200

Thr Pro Val Val Ser Lys Asn Gln Thr Glu Asn Thr Thr Asp Gln
1205 1210 1215

Pro Thr Glu Arg Glu Lys Thr Ala Lys Val Glu Thr Glu Lys Thr
1220 1225 1230

Gln Glu Pro Pro Gln Val Ala Ser Gln Ala Ser Pro Lys Gln Glu
1235 1240 1245

Gln Ser Glu Thr Val Gln Pro Gln Ala Val Leu Glu Ser Glu Asn
1250 1255 1260

Val Pro Thr Val Asn Asn Ala Glu Glu Val Gln Ala Gln Leu Gln
1265 1270 1275

Thr Gln Thr Ser Ala Thr Val Ser Thr Lys Gln Pro Ala Pro Glu
1280 1285 1290

Asn Ser Ile Asn Thr Gly Ser Ala Thr Ala Ile Thr Glu Thr Ala
1295 1300 1305

Glu Lys Ser Asp Lys Pro Gln Thr Glu Thr Ala Ala Ser Thr Glu
1310 1315 1320

Asp Ala Ser Gln His Lys Ala Asn Thr Val Ala Asp Asn Ser Val
1325 1330 1335

Ala Asn Asn Ser Glu Ser Ser Glu Pro Lys Ser Arg Arg Arg Arg
1340 1345 1350

Ser Ile Ser Gln Pro Gln Glu Thr Ser Ala Glu Glu Thr Thr Ala
1355 1360 1365

Ala Ser Thr Asp Glu Thr Thr Ile Ala Asp Asn Ser Lys Arg Ser
1370 1375 1380

Lys Pro Asn Arg Arg Ser Arg Arg Ser Val Arg Ser Glu Pro Thr
1385 1390 1395

Val Thr Asn Gly Ser Asp Arg Ser Thr Val Ala Leu Arg Asp Leu
1400 1405 1410

Thr Ser Thr Asn Thr Asn Ala Val Ile Ser Asp Ala Met Ala Lys
1415 1420 1425

Ala Gln Phe Val Ala Leu Asn Val Gly Lys Ala Val Ser Gln His
1430 1435 1440

Ile Ser Gln Leu Glu Met Asn Asn Glu Gly Gln Tyr Asn Val Trp

1445 1450 1455

Val Ser Asn Thr Ser Met Asn Glu Asn Tyr Ser Ser Ser Gln Tyr
1460 1465 1470

Arg Arg Phe Ser Ser Lys Ser Thr Gln Thr Gln Leu Gly Trp Asp
1475 1480 1485

Gln Thr Ile Ser Asn Asn Val Gln Leu Gly Gly Val Phe Thr Tyr
1490 1495 1500

Val Arg Asn Ser Asn Asn Phe Asp Lys Ala Ser Ser Lys Asn Thr
1505 1510 1515

Leu Ala Gln Val Asn Phe Tyr Ser Lys Tyr Tyr Ala Asp Asn His
1520 1525 1530

Trp Tyr Leu Gly Ile Asp Leu Gly Tyr Gly Lys Phe Gln Ser Asn
1535 1540 1545

Leu Lys Thr Asn His Asn Ala Lys Phe Ala Arg His Thr Ala Gln
1550 1555 1560

Phe Gly Leu Thr Ala Gly Lys Ala Phe Asn Leu Gly Asn Phe Gly
1565 1570 1575

Ile Thr Pro Ile Val Gly Val Arg Tyr Ser Tyr Leu Ser Asn Ala
1580 1585 1590

Asn Phe Ala Leu Ala Lys Asp Arg Ile Lys Val Asn Pro Ile Ser
1595 1600 1605

Val Lys Thr Ala Phe Ala Gln Val Asp Leu Ser Tyr Thr Tyr His
1610 1615 1620

Leu Gly Glu Phe Ser Val Thr Pro Ile Leu Ser Ala Arg Tyr Asp
1625 1630 1635

Thr Asn Gln Gly Ser Gly Lys Ile Asn Val Asn Gln Tyr Asp Phe
1640 1645 1650

Ala Tyr Asn Val Glu Asn Gln Gln Gln Tyr Asn Ala Gly Leu Lys
1655 1660 1665

Leu Lys Tyr His Asn Val Lys Leu Ser Leu Ile Gly Gly Leu Thr
1670 1675 1680

Lys Ala Lys Gln Ala Glu Lys Gln Lys Thr Ala Glu Leu Lys Leu
1685 1690 1695

Ser Phe Ser Phe
1700

<210> 6
<211> 1848
<212> PRT
<213> Haemophilus influenzae

<400> 6

Met Leu Asn Lys Lys Phe Lys Leu Asn Phe Ile Ala Leu Thr Val Ala
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Tyr Ala Leu Thr Pro Tyr Thr Glu Ala Ala Leu Val Arg Asp Asp Val
20 25 30

Asp Tyr Gln Ile Phe Arg Asp Phe Ala Glu Asn Lys Gly Lys Phe Ser
35 40 45

Val Gly Ala Thr Asn Val Glu Val Arg Asp Lys Lys Asn Gln Ser Leu
50 55 60

Gly Ser Ala Leu Pro Asn Gly Ile Pro Met Ile Asp Phe Ser Val Val
65 70 75 80

Asp Val Asp Lys Arg Ile Ala Thr Leu Val Asn Pro Gln Tyr Val Val
85 90 95

Gly Val Lys His Val Ser Asn Gly Val Ser Glu Leu His Phe Gly Asn
100 105 110

Leu Asn Gly Asn Met Asn Asn Gly Asn Ala Lys Ser His Arg Asp Val
115 120 125

Ser Ser Glu Glu Asn Arg Tyr Tyr Thr Val Glu Lys Asn Asn Phe Pro
130 135 140

Thr Glu Asn Val Thr Ser Phe Thr Lys Glu Glu Gln Asp Ala Gln Lys
145 150 155 160

Arg Arg Glu Asp Tyr Tyr Met Pro Arg Leu Asp Lys Phe Val Thr Glu
165 170 175

Val Ala Pro Ile Glu Ala Ser Thr Ala Asn Asn Asn Lys Gly Glu Tyr
180 185 190

Asn Asn Ser Asp Lys Tyr Pro Ala Phe Val Arg Leu Gly Ser Gly Thr
195 200 205

Gln Phe Ile Tyr Lys Lys Gly Ser Arg Tyr Gln Leu Ile Leu Thr Glu
210 215 220

Lys Asp Lys Gln Gly Asn Leu Leu Arg Asn Trp Asp Val Gly Gly Asp
225 230 235 240

Asn Leu Glu Leu Val Gly Asn Ala Tyr Thr Tyr Gly Ile Ala Gly Thr
245 250 255

Pro Tyr Lys Val Asn His Glu Asn Asn Gly Leu Ile Gly Phe Gly Asn
260 265 270

Ser Lys Glu Glu His Ser Asp Pro Lys Gly Ile Leu Ser Gln Asp Pro
275 280 285

Leu Thr Asn Tyr Ala Val Leu Gly Asp Ser Gly Ser Pro Leu Phe Val
290 295 300

Tyr Asp Arg Glu Lys Gly Lys Trp Leu Phe Leu Gly Ser Tyr Asp Phe
305 310 315 320

Trp Ala Gly Tyr Asn Lys Lys Ser Trp Gln Glu Trp Asn Ile Tyr Lys
325 330 335

His Glu Phe Ala Glu Lys Ile Tyr Gln Gln Tyr Ser Ala Gly Ser Leu
340 345 350

Ile Gly Ser Asn Thr Gln Tyr Thr Trp Gln Ala Thr Gly Ser Thr Ser
355 360 365

Thr Ile Thr Gly Gly Glu Pro Leu Ser Val Asp Leu Thr Asp Gly

370

375

380

Lys Asp Lys Pro Asn His Gly Lys Ser Ile Thr Leu Lys Gly Ser Gly
385 390 395 400

Thr Leu Thr Leu Asn Asn His Ile Asp Gln Gly Ala Gly Gly Leu Phe
405 410 415

Phe Glu Gly Asp Tyr Glu Val Lys Gly Thr Ser Asp Ser Thr Thr Trp
420 425 430

Lys Gly Ala Gly Val Ser Val Ala Asp Gly Lys Thr Val Thr Trp Lys
435 440 445

Val His Asn Pro Lys Tyr Asp Arg Leu Ala Lys Ile Gly Lys Gly Thr
450 455 460

Leu Val Val Glu Gly Lys Gly Lys Asn Glu Gly Leu Leu Lys Val Gly
465 470 475 480

Asp Gly Thr Val Ile Leu Lys Gln Lys Ala Asp Ala Asn Asn Lys Val
485 490 495

Gln Ala Phe Ser Gln Val Gly Ile Val Ser Gly Arg Ser Thr Leu Val
500 505 510

Leu Asn Asp Asp Lys Gln Val Asp Pro Asn Ser Ile Tyr Phe Gly Phe
515 520 525

Arg Gly Gly Arg Leu Asp Leu Asn Gly Asn Ser Leu Thr Phe Asp His
530 535 540

Ile Arg Asn Ile Asp Asp Gly Ala Arg Val Val Asn His Asn Met Thr
545 550 555 560

Asn Thr Ser Asn Ile Thr Ile Thr Gly Glu Ser Leu Ile Thr Asn Pro
565 570 575

Asn Thr Ile Thr Ser Tyr Asn Ile Glu Ala Gln Asp Asp Asp His Pro
580 585 590

Leu Arg Ile Arg Ser Ile Pro Tyr Arg Gln Leu Tyr Phe Asn Gln Asp
595 600 605

Asn Arg Ser Tyr Tyr Thr Leu Lys Lys Gly Ala Ser Thr Arg Ser Glu
610 615 620

Leu Pro Gln Asn Ser Gly Glu Ser Asn Glu Asn Trp Leu Tyr Met Gly
625 630 635 640

Arg Thr Ser Asp Ala Ala Lys Arg Asn Val Met Asn His Ile Asn Asn
645 650 655

Glu Arg Met Asn Gly Phe Asn Gly Tyr Phe Gly Glu Glu Glu Thr Lys
660 665 670

Ala Thr Gln Asn Gly Lys Leu Asn Val Thr Phe Asn Gly Lys Ser Asp
675 680 685

Gln Asn Arg Phe Leu Leu Thr Gly Gly Thr Asn Leu Asn Gly Asp Leu
690 695 700

Asn Val Glu Lys Gly Thr Leu Phe Leu Ser Gly Arg Pro Thr Pro His
705 710 715 720

Ala Arg Asp Ile Ala Gly Ile Ser Ser Thr Lys Lys Asp Pro His Phe
725 730 735

Thr Glu Asn Asn Glu Val Val Glu Asp Asp Trp Ile Asn Arg Asn
740 745 750

Phe Lys Ala Thr Thr Met Asn Val Thr Gly Asn Ala Ser Leu Tyr Ser
755 760 765

Gly Arg Asn Val Ala Asn Ile Thr Ser Asn Ile Thr Ala Ser Asn Asn
770 775 780

Ala Gln Val His Ile Gly Tyr Lys Thr Gly Asp Thr Val Cys Val Arg
785 790 795 800

Ser Asp Tyr Thr Gly Tyr Val Thr Cys His Asn Ser Asn Leu Ser Glu
805 810 815

Lys Ala Leu Asn Ser Phe Asn Pro Thr Asn Leu Arg Gly Asn Val Asn
820 825 830

Leu Thr Glu Asn Ala Ser Phe Thr Leu Gly Lys Ala Asn Leu Phe Gly
835 840 845

Thr Ile Gln Ser Ile Gly Thr Ser Gln Val Asn Leu Lys Glu Asn Ser
850 855 860

His Trp His Leu Thr Gly Asn Ser Asn Val Asn Gln Leu Asn Leu Thr
865 870 875 880

Asn Gly His Ile His Leu Asn Ala Gln Asn Asp Ala Asn Lys Val Thr
885 890 895

Thr Tyr Asn Thr Leu Thr Val Asn Ser Leu Ser Gly Asn Gly Ser Phe
900 905 910

Tyr Tyr Trp Val Asp Phe Thr Asn Asn Lys Ser Asn Lys Val Val Val
915 920 925

Asn Lys Ser Ala Thr Gly Asn Phe Thr Leu Gln Val Ala Asp Lys Thr
930 935 940

Gly Glu Pro Asn His Asn Glu Leu Thr Leu Phe Asp Ala Ser Asn Ala
945 950 955 960

Thr Arg Asn Asn Leu Glu Val Thr Leu Ala Asn Gly Ser Val Asp Arg
965 970 975

Gly Ala Trp Lys Tyr Lys Leu Arg Asn Val Asn Gly Arg Tyr Asp Leu
980 985 990

Tyr Asn Pro Glu Val Glu Lys Arg Asn Gln Thr Val Asp Thr Thr Asn
995 1000 1005

Ile Thr Thr Pro Asn Asp Ile Gln Ala Asp Ala Pro Ser Ala Gln
1010 1015 1020

Ser Asn Asn Glu Glu Ile Ala Arg Val Glu Thr Pro Val Pro Pro
1025 1030 1035

Pro Ala Pro Ala Thr Glu Ser Ala Ile Ala Ser Glu Gln Pro Glu
1040 1045 1050

Thr Arg Pro Ala Glu Thr Ala Gln Pro Ala Met Glu Glu Thr Asn
1055 1060 1065

Thr Ala Asn Ser Thr Glu Thr Ala Pro Lys Ser Asp Thr Ala Thr
1070 1075 1080

Gln Thr Glu Asn Pro Asn Ser Glu Ser Val Pro Ser Glu Thr Thr
1085 1090 1095

Glu Lys Val Ala Glu Asn Pro Pro Gln Glu Asn Glu Thr Val Ala
1100 1105 1110

Lys Asn Glu Gln Glu Ala Thr Glu Pro Thr Pro Gln Asn Gly Glu
1115 1120 1125

Val Ala Lys Glu Asp Gln Pro Thr Val Glu Ala Asn Thr Gln Thr
1130 1135 1140

Asn Glu Ala Thr Gln Ser Glu Gly Lys Thr Glu Glu Thr Gln Thr
1145 1150 1155

Ala Glu Thr Lys Ser Glu Pro Thr Glu Ser Val Thr Val Ser Glu
1160 1165 1170

Asn Gln Pro Glu Lys Thr Val Ser Gln Ser Thr Glu Asp Lys Val
1175 1180 1185

Val Val Glu Lys Glu Glu Lys Ala Lys Val Glu Thr Glu Glu Thr
1190 1195 1200

Gln Lys Ala Pro Gln Val Thr Ser Lys Glu Pro Pro Lys Gln Ala
1205 1210 1215

Glu Pro Ala Pro Glu Glu Val Pro Thr Asp Thr Asn Ala Glu Glu
1220 1225 1230

Ala Gln Ala Leu Gln Gln Thr Gln Pro Thr Thr Val Ala Ala Ala
1235 1240 1245

Glu Thr Thr Ser Pro Asn Ser Lys Pro Ala Glu Glu Thr Gln Gln
1250 1255 1260

Pro Ser Glu Lys Thr Asn Ala Glu Pro Val Thr Pro Val Val Ser

1265

1270

1275

Glu Asn Thr Ala Thr Gln Pro Thr Glu Thr Glu Glu Thr Ala Lys
1280 1285 1290

Val Glu Lys Glu Lys Thr Gln Glu Val Pro Gln Val Ala Ser Gln
1295 1300 1305

Glu Ser Pro Lys Gln Glu Gln Pro Ala Ala Lys Pro Gln Ala Gln
1310 1315 1320

Thr Lys Pro Gln Ala Glu Pro Ala Arg Glu Asn Val Leu Thr Thr
1325 1330 1335

Lys Asn Val Gly Glu Pro Gln Pro Gln Ala Gln Pro Gln Thr Gln
1340 1345 1350

Ser Thr Ala Val Pro Thr Thr Gly Glu Thr Ala Ala Asn Ser Lys
1355 1360 1365

Pro Ala Ala Lys Pro Gln Ala Gln Ala Lys Pro Gln Thr Glu Pro
1370 1375 1380

Ala Arg Glu Asn Val Ser Thr Val Asn Thr Lys Glu Pro Gln Ser
1385 1390 1395

Gln Thr Ser Ala Thr Val Ser Thr Glu Gln Pro Ala Lys Glu Thr
1400 1405 1410

Ser Ser Asn Val Glu Gln Pro Ala Pro Glu Asn Ser Ile Asn Thr
1415 1420 1425

Gly Ser Ala Thr Thr Met Thr Glu Thr Ala Glu Lys Ser Asp Lys
1430 1435 1440

Pro Gln Met Glu Thr Val Thr Glu Asn Asp Arg Gln Pro Glu Ala
1445 1450 1455

Asn Thr Val Ala Asp Asn Ser Val Ala Asn Asn Ser Glu Ser Ser
1460 1465 1470

Glu Ser Lys Ser Arg Arg Arg Ser Val Ser Gln Pro Lys Glu
1475 1480 1485

Thr Ser Ala Glu Glu Thr Thr Val Ala Ser Thr Gln Glu Thr Thr
1490 1495 1500

Val Asp Asn Ser Val Ser Thr Pro Lys Pro Arg Ser Arg Arg Thr
1505 1510 1515

Arg Arg Ser Val Gln Thr Asn Ser Tyr Glu Pro Val Glu Leu Pro
1520 1525 1530

Thr Glu Asn Ala Glu Asn Ala Glu Asn Val Gln Ser Gly Asn Asn
1535 1540 1545

Val Ala Asn Ser Gln Pro Ala Leu Arg Asn Leu Thr Ser Lys Asn
1550 1555 1560

Thr Asn Ala Val Ile Ser Asn Ala Met Ala Lys Ala Gln Phe Val
1565 1570 1575

Ala Leu Asn Val Gly Lys Ala Val Ser Gln His Ile Ser Gln Leu
1580 1585 1590

Glu Met Asn Asn Glu Gly Gln Tyr Asn Val Trp Ile Ser Asn Thr
1595 1600 1605

Ser Met Asn Lys Asn Tyr Ser Ser Glu Gln Tyr Arg Arg Phe Ser
1610 1615 1620

Ser Lys Ser Thr Gln Thr Gln Leu Gly Trp Asp Gln Thr Ile Ser
1625 1630 1635

Asn Asn Val Gln Leu Gly Gly Val Phe Thr Tyr Val Arg Asn Ser
1640 1645 1650

Asn Asn Phe Asp Lys Ala Ser Ser Lys Asn Thr Leu Ala Gln Val
1655 1660 1665

Asn Phe Tyr Ser Lys Tyr Tyr Ala Asp Asn His Trp Tyr Leu Gly
1670 1675 1680

Ile Asp Leu Gly Tyr Gly Lys Phe Gln Ser Asn Leu Gln Thr Asn
1685 1690 1695

Asn Asn Ala Lys Phe Ala Arg His Thr Ala Gln Ile Gly Leu Thr
1700 1705 1710

Ala Gly Lys Ala Phe Asn Leu Gly Asn Phe Ala Val Lys Pro Thr
1715 1720 1725

Val Gly Val Arg Tyr Ser Tyr Leu Ser Asn Ala Asp Phe Ala Leu
1730 1735 1740

Ala Gln Asp Arg Ile Lys Val Asn Pro Ile Ser Val Lys Thr Ala
1745 1750 1755

Phe Ala Gln Val Asp Leu Ser Tyr Thr Tyr His Leu Gly Glu Phe
1760 1765 1770

Ser Ile Thr Pro Ile Leu Ser Ala Arg Tyr Asp Ala Asn Gln Gly
1775 1780 1785

Asn Gly Lys Ile Asn Val Ser Val Tyr Asp Phe Ala Tyr Asn Val
1790 1795 1800

Glu Asn Gln Gln Gln Tyr Asn Ala Gly Leu Lys Leu Lys Tyr His
1805 1810 1815

Asn Val Lys Leu Ser Leu Ile Gly Gly Leu Thr Lys Ala Lys Gln
1820 1825 1830

Ala Glu Lys Gln Lys Thr Ala Glu Val Lys Leu Ser Phe Ser Phe
1835 1840 1845

<210> 7
<211> 1395
<212> PRT
<213> Haemophilus influenzae

<400> 7

Met Lys Lys Thr Val Phe Arg Leu Asn Phe Leu Thr Ala Cys Ile Ser
1 5 10 15

Leu Gly Ile Val Ser Gln Ala Trp Ala Gly His Thr Tyr Phe Gly Ile
20 25 30

Asp Tyr Gln Tyr Tyr Arg Asp Phe Ala Glu Asn Lys Gly Lys Phe Thr

35

40

45

Val Gly Ala Gln Asn Ile Lys Val Tyr Asn Lys Gln Gly Gln Leu Val
50 55 60

Gly Thr Ser Met Thr Lys Ala Pro Met Ile Asp Phe Ser Val Val Ser
65 70 75 80

Arg Asn Gly Val Ala Ala Leu Val Glu Asn Gln Tyr Ile Val Ser Val
85 90 95

Ala His Asn Val Gly Tyr Thr Asp Val Asp Phe Gly Ala Glu Gly Asn
100 105 110

Asn Pro Asp Gln His Arg Phe Thr Tyr Lys Ile Val Lys Arg Asn Asn
115 120 125

Tyr Lys Lys Asp Asn Leu His Pro Tyr Glu Asp Asp Tyr His Asn Pro
130 135 140

Arg Leu His Lys Phe Val Thr Glu Ala Ala Pro Ile Asp Met Thr Ser
145 150 155 160

Asn Met Asn Gly Ser Thr Tyr Ser Asp Arg Thr Lys Tyr Pro Glu Arg
165 170 175

Val Arg Ile Gly Ser Gly Arg Gln Phe Trp Arg Asn Asp Gln Asp Lys
180 185 190

Gly Asp Gln Val Ala Gly Ala Tyr His Tyr Leu Thr Ala Gly Asn Thr
195 200 205

His Asn Gln Arg Gly Ala Gly Asn Gly Tyr Ser Tyr Leu Gly Gly Asp
210 215 220

Val Arg Lys Ala Gly Glu Tyr Gly Pro Leu Pro Ile Ala Gly Ser Lys
225 230 235 240

Gly Asp Ser Gly Ser Pro Met Phe Ile Tyr Asp Ala Glu Lys Gln Lys
245 250 255

Trp Leu Ile Asn Gly Ile Leu Arg Glu Gly Asn Pro Phe Glu Gly Lys
260 265 270

Glu Asn Gly Phe Gln Leu Val Arg Lys Ser Tyr Phe Asp Glu Ile Phe
275 280 285

Glu Arg Asp Leu His Thr Ser Leu Tyr Thr Arg Ala Gly Asn Gly Val
290 295 300

Tyr Thr Ile Ser Gly Asn Asp Asn Gly Gln Gly Ser Ile Thr Gln Lys
305 310 315 320

Ser Gly Ile Pro Ser Glu Ile Lys Ile Thr Leu Ala Asn Met Ser Leu
325 330 335

Pro Leu Lys Glu Lys Asp Lys Val His Asn Pro Arg Tyr Asp Gly Pro
340 345 350

Asn Ile Tyr Ser Pro Arg Leu Asn Asn Gly Glu Thr Leu Tyr Phe Met
355 360 365

Asp Gln Lys Gln Gly Ser Leu Ile Phe Ala Ser Asp Ile Asn Gln Gly
370 375 380

Ala Gly Gly Leu Tyr Phe Glu Gly Asn Phe Thr Val Ser Pro Asn Ser
385 390 395 400

Asn Gln Thr Trp Gln Gly Ala Gly Ile His Val Ser Glu Asn Ser Thr
405 410 415

Val Thr Trp Lys Val Asn Gly Val Glu His Asp Arg Leu Ser Lys Ile
420 425 430

Gly Lys Gly Thr Leu His Val Gln Ala Lys Gly Glu Asn Lys Gly Ser
435 440 445

Ile Ser Val Gly Asp Gly Lys Val Ile Leu Glu Gln Gln Ala Asp Asp
450 455 460

Gln Gly Asn Lys Gln Ala Phe Ser Glu Ile Gly Leu Val Ser Gly Arg
465 470 475 480

Gly Thr Val Gln Leu Asn Asp Asp Lys Gln Phe Asp Thr Asp Lys Phe
485 490 495

Tyr Phe Gly Phe Arg Gly Gly Arg Leu Asp Leu Asn Gly His Ser Leu
500 505 510

Thr Phe Lys Arg Ile Gln Asn Thr Asp Glu Gly Ala Met Ile Val Asn
515 520 525

His Asn Thr Thr Gln Ala Ala Asn Val Thr Ile Thr Gly Asn Glu Ser
530 535 540

Ile Val Leu Pro Asn Gly Asn Asn Ile Asn Lys Leu Asp Tyr Arg Lys
545 550 555 560

Glu Ile Ala Tyr Asn Gly Trp Phe Gly Glu Thr Asp Lys Asn Lys His
565 570 575

Asn Gly Arg Leu Asn Leu Ile Tyr Lys Pro Thr Thr Glu Asp Arg Thr
580 585 590

Leu Leu Leu Ser Gly Gly Thr Asn Leu Lys Gly Asp Ile Thr Gln Thr
595 600 605

Lys Gly Lys Leu Phe Phe Ser Gly Arg Pro Thr Pro His Ala Tyr Asn
610 615 620

His Leu Asn Lys Arg Trp Ser Glu Met Glu Gly Ile Pro Gln Gly Glu
625 630 635 640

Ile Val Trp Asp His Asp Trp Ile Asn Arg Thr Phe Lys Ala Glu Asn
645 650 655

Phe Gln Ile Lys Gly Gly Ser Ala Val Val Ser Arg Asn Val Ser Ser
660 665 670

Ile Glu Gly Asn Trp Thr Val Ser Asn Asn Ala Asn Ala Thr Phe Gly
675 680 685

Val Val Pro Asn Gln Gln Asn Thr Ile Cys Thr Arg Ser Asp Trp Thr
690 695 700

Gly Leu Thr Thr Cys Gln Lys Val Asp Leu Thr Asp Thr Lys Val Ile
705 710 715 720

Asn Ser Ile Pro Lys Thr Gln Ile Asn Gly Ser Ile Asn Leu Thr Asp
725 730 735

Asn Ala Thr Ala Asn Val Lys Gly Leu Ala Lys Leu Asn Gly Asn Val
740 745 750

Thr Leu Thr Asn His Ser Gln Phe Thr Leu Ser Asn Asn Ala Thr Gln
755 760 765

Ile Gly Asn Ile Arg Leu Ser Asp Asn Ser Thr Ala Thr Val Asp Asn
770 775 780

Ala Asn Leu Asn Gly Asn Val His Leu Thr Asp Ser Ala Gln Phe Ser
785 790 795 800

Leu Lys Asn Ser His Phe Ser His Gln Ile Gln Gly Asp Lys Gly Thr
805 810 815

Thr Val Thr Leu Glu Asn Ala Thr Trp Thr Met Pro Ser Asp Thr Thr
820 825 830

Leu Gln Asn Leu Thr Leu Asn Asn Ser Thr Ile Thr Leu Asn Ser Ala
835 840 845

Tyr Ser Ala Ser Ser Asn Asn Thr Pro Arg Arg Arg Arg Arg Ser Leu
850 855 860

Glu Thr Glu Thr Thr Pro Thr Ser Ala Glu His Arg Phe Asn Thr Leu
865 870 875 880

Thr Val Asn Gly Lys Leu Ser Gly Gln Gly Thr Phe Gln Phe Thr Ser
885 890 895

Ser Leu Phe Gly Tyr Lys Ser Asp Lys Leu Lys Leu Ser Asn Asp Ala
900 905 910

Glu Gly Asp Tyr Ile Leu Ser Val Arg Asn Thr Gly Lys Glu Pro Glu
915 920 925

Thr Leu Glu Gln Leu Thr Leu Val Glu Ser Lys Asp Asn Gln Pro Leu
930 935 940

Ser Asp Lys Leu Lys Phe Thr Leu Glu Asn Asp His Val Asp Ala Gly

945 950 955 960

Ala Leu Arg Tyr Lys Leu Val Lys Asn Asp Gly Glu Phe Arg Leu His
965 970 975

Asn Pro Ile Lys Glu Gln Glu Leu His Asn Asp Leu Val Arg Ala Glu
980 985 990

Gln Ala Glu Arg Thr Leu Glu Ala Lys Gln Val Glu Pro Thr Ala Lys
995 1000 1005

Thr Gln Thr Gly Glu Pro Lys Val Arg Ser Arg Arg Ala Ala Arg
1010 1015 1020

Ala Ala Phe Pro Asp Thr Leu Pro Asp Gln Ser Leu Leu Asn Ala
1025 1030 1035

Leu Glu Ala Lys Gln Ala Glu Leu Thr Ala Glu Thr Gln Lys Ser
1040 1045 1050

Lys Ala Lys Thr Lys Lys Val Arg Ser Lys Arg Ala Val Phe Ser
1055 1060 1065

Asp Pro Leu Leu Asp Gln Ser Leu Phe Ala Leu Glu Ala Ala Leu
1070 1075 1080

Glu Val Ile Asp Ala Pro Gln Gln Ser Glu Lys Asp Arg Leu Ala
1085 1090 1095

Gln Glu Glu Ala Glu Lys Gln Arg Lys Gln Lys Asp Leu Ile Ser
1100 1105 1110

Arg Tyr Ser Asn Ser Ala Leu Ser Glu Leu Ser Ala Thr Val Asn
1115 1120 1125

Ser Met Leu Ser Val Gln Asp Glu Leu Asp Arg Leu Phe Val Asp
1130 1135 1140

Gln Ala Gln Ser Ala Val Trp Thr Asn Ile Ala Gln Asp Lys Arg
1145 1150 1155

Arg Tyr Asp Ser Asp Ala Phe Arg Ala Tyr Gln Gln Lys Thr Asn
1160 1165 1170

Leu Arg Gln Ile Gly Val Gln Lys Ala Leu Ala Asn Gly Arg Ile
1175 1180 1185

Gly Ala Val Phe Ser His Ser Arg Ser Asp Asn Thr Phe Asp Glu
1190 1195 1200

Gln Val Lys Asn His Ala Thr Leu Thr Met Met Ser Gly Phe Ala
1205 1210 1215

Gln Tyr Gln Trp Gly Asp Leu Gln Phe Gly Val Asn Val Gly Thr
1220 1225 1230

Gly Ile Ser Ala Ser Lys Met Ala Glu Glu Gln Ser Arg Lys Ile
1235 1240 1245

His Arg Lys Ala Ile Asn Tyr Gly Val Asn Ala Ser Tyr Gln Phe
1250 1255 1260

Arg Leu Gly Gln Leu Gly Ile Gln Pro Tyr Phe Gly Val Asn Arg
1265 1270 1275

Tyr Phe Ile Glu Arg Glu Asn Tyr Gln Ser Glu Glu Val Arg Val
1280 1285 1290

Lys Thr Pro Ser Leu Ala Phe Asn Arg Tyr Asn Ala Gly Ile Arg
1295 1300 1305

Val Asp Tyr Thr Phe Thr Pro Thr Asp Asn Ile Ser Val Lys Pro
1310 1315 1320

Tyr Phe Phe Val Asn Tyr Val Asp Val Ser Asn Ala Asn Val Gln
1325 1330 1335

Thr Thr Val Asn Leu Thr Val Leu Gln Gln Pro Phe Gly Arg Tyr
1340 1345 1350

Trp Gln Lys Glu Val Gly Leu Lys Ala Glu Ile Leu His Phe Gln
1355 1360 1365

Ile Ser Ala Phe Ile Ser Lys Ser Gln Gly Ser Gln Leu Gly Lys
1370 1375 1380

Gln Gln Asn Val Gly Val Lys Leu Gly Tyr Arg Trp
1385 1390 1395

<210> 8
<211> 4305
<212> DNA
<213> Haemophilus influenzae

<220>
<221> misc_feature
<222> (1702) .. (1702)
<223> "n" at position 1702 can be any base.

<220>
<221> CDS
<222> (1) .. (4305)
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Met Lys Lys Thr Val Phe Arg Leu Asn Phe Leu Thr Ala Cys Ile Ser
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tta ggg ata gta tcg caa gcg tgg gca ggt cat act tat ttt ggg att 96
Leu Gly Ile Val Ser Gln Ala Trp Ala Gly His Thr Tyr Phe Gly Ile
20 25 30

gac tac caa tat tat cgt gat ttt gcc gag aat gaa ggc aag ttt gca 144
Asp Tyr Gln Tyr Tyr Arg Asp Phe Ala Glu Asn Glu Gly Lys Phe Ala
35 40 45

gtt ggg gct aaa aat att gat gtt tat aac aaa gaa ggg caa tta gtt 192
Val Gly Ala Lys Asn Ile Asp Val Tyr Asn Lys Glu Gly Gln Leu Val
50 55 60

ggc aca tca atg aca aaa gcc ccg atg att gat ttc tca gtc gtt tcc 240
Gly Thr Ser Met Thr Lys Ala Pro Met Ile Asp Phe Ser Val Val Ser
65 70 75 80

aga aat gga gtt gct gcc tta gta ggc gat cag tat att gtg agt gtg 288
Arg Asn Gly Val Ala Ala Leu Val Gly Asp Gln Tyr Ile Val Ser Val
85 90 95

gca cat aat gta ggc tat acc aat gtg gat ttt ggt gct gaa gga caa 336
Ala His Asn Val Gly Tyr Thr Asn Val Asp Phe Gly Ala Glu Gly Gln
100 105 110

aat cct gat caa cat cgt ttt act tat aaa att gtg aaa cgg aat aat 384
Asn Pro Asp Gln His Arg Phe Thr Tyr Lys Ile Val Lys Arg Asn Asn
115 120 125

tat aat cac gat gcg aag cac cgc tat cta gat gac tac cat aat cca 432
Tyr Asn His Asp Ala Lys His Arg Tyr Leu Asp Asp Tyr His Asn Pro

130	135	140	
cgt tta cat aaa ttt gta acg gat gcg gca cca att gat atg act tca Arg Leu His Lys Phe Val Thr Asp Ala Ala Pro Ile Asp Met Thr Ser			480
145	150	155	160
cat atg gat ggc aat aag tat gca aat aag gaa aaa tat cct gaa cga His Met Asp Gly Asn Lys Tyr Ala Asn Lys Glu Lys Tyr Pro Glu Arg			528
165	170	175	
gta cgc gtc gga tct gga gat cag tat tgg gat gac gat caa aac aac Val Arg Val Gly Ser Gly Asp Gln Tyr Trp Asp Asp Asp Gln Asn Asn			576
180	185	190	
aga act tat tta tct gac gga tat aat tat tta aca ggt ggg aat aca Arg Thr Tyr Leu Ser Asp Gly Tyr Asn Tyr Leu Thr Gly Gly Asn Thr			624
195	200	205	
tat aat caa agc ggt aga ggt gat gga tat tca tat gtg aga ggt gat Tyr Asn Gln Ser Gly Arg Gly Asp Gly Tyr Ser Tyr Val Arg Gly Asp			672
210	215	220	
att cgc aaa gtt ggc gat tat ggt cca tta ccg att gca agt tca ttc Ile Arg Lys Val Gly Asp Tyr Gly Pro Leu Pro Ile Ala Ser Ser Phe			720
225	230	235	240
ggg gac agt gga tct cca atg ttt att tat gat gct gaa aca caa aaa Gly Asp Ser Gly Ser Pro Met Phe Ile Tyr Asp Ala Glu Thr Gln Lys			768
245	250	255	
tgg cta att aat gga gta ttg cgg gag ggg caa cct tat aca ggc gaa Trp Leu Ile Asn Gly Val Leu Arg Glu Gly Gln Pro Tyr Thr Gly Glu			816
260	265	270	
ttc gat gga ttt caa tta gcc cgt aaa tct ttc ctt gat gaa att ata Phe Asp Gly Phe Gln Leu Ala Arg Lys Ser Phe Leu Asp Glu Ile Ile			864
275	280	285	
cgc aaa gat caa cca aat ggt ttt tta acc cct aag ggg aat ggc gtt Arg Lys Asp Gln Pro Asn Gly Phe Leu Thr Pro Lys Gly Asn Gly Val			912
290	295	300	
tat acc att tct aaa agt gac gat ggg ata gga gtt gtt act tcg aaa Tyr Thr Ile Ser Lys Ser Asp Asp Gly Ile Gly Val Val Thr Ser Lys			960
305	310	315	320
att gga aaa cct cgt gaa ata cct tta gcg aac aac aaa tta aaa ata Ile Gly Lys Pro Arg Glu Ile Pro Leu Ala Asn Asn Lys Leu Lys Ile			1008
325	330	335	
gaa gat aaa gat act gtc tat aat aac aga tat aat ggt cct aat att Glu Asp Lys Asp Thr Val Tyr Asn Asn Arg Tyr Asn Gly Pro Asn Ile			1056
340	345	350	
tat tct cct caa tta aac aat ggc aag aat att tat ttt gga gat gaa Tyr Ser Pro Gln Leu Asn Asn Gly Lys Asn Ile Tyr Phe Gly Asp Glu			1104
355	360	365	

gaa tta gga tcc ata act tta acg act gat atc gat caa ggt gca ggc Glu Leu Gly Ser Ile Thr Leu Thr Thr Asp Ile Asp Gln Gly Ala Gly 370 375 380	1152
ggt ttg tat ttt gag ggg gat ttt ata gtt tcg cct acc aaa aat gaa Gly Leu Tyr Phe Glu Gly Asp Phe Ile Val Ser Pro Thr Lys Asn Glu 385 390 395 400	1200
acg tgg aaa ggt gcg ggc att cat gtc agt gaa att agt acc gtt act Thr Trp Lys Gly Ala Gly Ile His Val Ser Glu Ile Ser Thr Val Thr 405 410 415	1248
tgg aaa gta aac ggc gtg gaa aat gat cga ctt tct aaa atc ggt aaa Trp Lys Val Asn Gly Val Glu Asn Asp Arg Leu Ser Lys Ile Gly Lys 420 425 430	1296
gga aca tta cac gtt aaa gcc aaa ggg gaa aat aaa ggt tcg atc agc Gly Thr Leu His Val Lys Ala Lys Gly Glu Asn Lys Gly Ser Ile Ser 435 440 445	1344
gta ggc gat ggt aaa gtc att ttg gag cag cag gca gac gat caa ggc Val Gly Asp Gly Lys Val Ile Leu Glu Gln Gln Ala Asp Asp Gln Gly 450 455 460	1392
aac aaa caa gcc ttt agt gaa att ggc ttg gtt agc ggc aga ggg act Asn Lys Gln Ala Phe Ser Glu Ile Gly Leu Val Ser Gly Arg Gly Thr 465 470 475 480	1440
gtt caa tta aac gat gat aaa caa ttt gat acc gat aaa ttt tat ttc Val Gln Leu Asn Asp Asp Lys Gln Phe Asp Thr Asp Lys Phe Tyr Phe 485 490 495	1488
ggc ttt cgt ggt ggt cgc tta gat ctt aac gga cat tca tta acc ttt Gly Phe Arg Gly Arg Leu Asp Leu Asn Gly His Ser Leu Thr Phe 500 505 510	1536
aaa cgt atc caa aat acg gac gag ggg gcg atg att gtg aac cat aat Lys Arg Ile Gln Asn Thr Asp Glu Gly Ala Met Ile Val Asn His Asn 515 520 525	1584
aca act caa gtc gct aat att act att act ggg aac gaa agt att act Thr Thr Gln Val Ala Asn Ile Thr Ile Thr Gly Asn Glu Ser Ile Thr 530 535 540	1632
gct cca tct aat aaa aat att att aat aaa ctt gat tac agc aaa gaa Ala Pro Ser Asn Lys Asn Asn Ile Asn Lys Leu Asp Tyr Ser Lys Glu 545 550 555 560	1680
att gcc tac aac ggc tgg ttt ngc gaa aca gat aaa aat aaa cat aat Ile Ala Tyr Asn Gly Trp Phe Xaa Glu Thr Asp Lys Asn Lys His Asn 565 570 575	1728
gga cga tta aac ctt att tat aaa cca acc aca gaa gat cgt act ttg Gly Arg Leu Asn Leu Ile Tyr Lys Pro Thr Thr Glu Asp Arg Thr Leu 580 585 590	1776

ctc ctt tca ggc ggc aca aac tta aaa ggc gat att act cca aca aaa Leu Leu Ser Gly Gly Thr Asn Leu Lys Gly Asp Ile Thr Gln Thr Lys 595 600 605	1824
ggt aaa cta ttt ttc agc ggt aga ccg aca ccc cac gcc tac aat cat Gly Lys Leu Phe Phe Ser Gly Arg Pro Thr Pro His Ala Tyr Asn His 610 615 620	1872
tta gac aaa cgt tgg tca gaa atg gaa ggt atc cca caa ggc gaa att Leu Asp Lys Arg Trp Ser Glu Met Glu Gly Ile Pro Gln Gly Glu Ile 625 630 635 640	1920
gtg tgg gat tac gat tgg att aac cgc aca ttt aaa gct gaa aac ttc Val Trp Asp Tyr Asp Trp Ile Asn Arg Thr Phe Lys Ala Glu Asn Phe 645 650 655	1968
caa att aaa ggc gga agt gcg gtg gtt tct cgc aat gtt tct tca att Gln Ile Lys Gly Gly Ser Ala Val Val Ser Arg Asn Val Ser Ser Ile 660 665 670	2016
gag gga aat tgg aca gtc agc aat aat gca aat gcc aca ttt ggt gtt Glu Gly Asn Trp Thr Val Ser Asn Asn Ala Asn Ala Thr Phe Gly Val 675 680 685	2064
gtg cca aat cag caa aat acc att tgc acg cgt tca gat tgg aca gga Val Pro Asn Gln Gln Asn Thr Ile Cys Thr Arg Ser Asp Trp Thr Gly 690 695 700	2112
tta acg act tgt aaa aca gtt aat tta acc gat aaa aaa gtt att gat Leu Thr Thr Cys Lys Thr Val Asn Leu Thr Asp Lys Lys Val Ile Asp 705 710 715 720	2160
tcc ata ccg aca aca caa att aat ggt tct att aat tta act gat aat Ser Ile Pro Thr Thr Gln Ile Asn Gly Ser Ile Asn Leu Thr Asp Asn 725 730 735	2208
gca aca gtg aat att aat ggt tta gca aaa ctt aat ggt aat gtc act Ala Thr Val Asn Ile Asn Gly Leu Ala Lys Leu Asn Gly Asn Val Thr 740 745 750	2256
tta ata aat cat agc caa ttt aca ttg agc aac aat gcc acc caa ata Leu Ile Asn His Ser Gln Phe Thr Leu Ser Asn Ala Thr Gln Ile 755 760 765	2304
ggc aat atc aaa ctt tca aat cac gca aat gca agg gta aat aat gcc Gly Asn Ile Lys Leu Ser Asn His Ala Asn Ala Arg Val Asn Asn Ala 770 775 780	2352
act tta atg ggc gat gtg aat tta gcg gat act agc cgt ttt aca tta Thr Leu Met Gly Asp Val Asn Leu Ala Asp Thr Ser Arg Phe Thr Leu 785 790 795 800	2400
agc aat caa gca aca cag att ggc aca atc agt ctt cat cag caa gct Ser Asn Gln Ala Thr Gln Ile Gly Thr Ile Ser Leu His Gln Gln Ala 805 810 815	2448
caa gca aca gtg gat aat gca aac ttg aac ggt aat gtg cat tta acg	2496

Gln Ala Thr Val Asp Asn Ala Asn Leu Asn Gly Asn Val His Leu Thr			
820	825	830	
gat tct gcc aga ttt tct tta aaa aac agt cat ttt tcg cac caa att			2544
Asp Ser Ala Arg Phe Ser Leu Lys Asn Ser His Phe Ser His Gln Ile			
835	840	845	
cag ggc gac aaa gac aca aca gtg acg ttg gaa aat gcg act tgg aca			2592
Gln Gly Asp Lys Asp Thr Thr Val Thr Leu Glu Asn Ala Thr Trp Thr			
850	855	860	
atg cct agc gat act aca ttg cag aat tta acg cta aat aat agt act			2640
Met Pro Ser Asp Thr Thr Leu Gln Asn Leu Thr Leu Asn Asn Ser Thr			
865	870	875	880
gtt acg tta aat tca gct tat tca gct agc tca aat aat gcg cca cgt			2688
Val Thr Leu Asn Ser Ala Tyr Ser Ala Ser Ser Asn Asn Ala Pro Arg			
885	890	895	
cgc cgc cgt tca tta gag acg gaa aca acg cca aca tcg gca gaa cat			2736
Arg Arg Arg Ser Leu Glu Thr Glu Thr Thr Pro Thr Ser Ala Glu His			
900	905	910	
cgt ttc aac aca ttg aca gta aat ggt aaa ttg agc ggg caa ggc aca			2784
Arg Phe Asn Thr Leu Thr Val Asn Gly Lys Leu Ser Gly Gln Gly Thr			
915	920	925	
ttc caa ttt act cca tct tta ttt ggc tat gaa agc gat aaa tta aaa			2832
Phe Gln Phe Thr Pro Ser Leu Phe Gly Tyr Glu Ser Asp Lys Leu Lys			
930	935	940	
tta tcc aat gac gct gag ggc gat tac aca tta tct gtt cgc aac aca			2880
Leu Ser Asn Asp Ala Glu Gly Asp Tyr Thr Leu Ser Val Arg Asn Thr			
945	950	955	960
ggc aaa gaa ccc gtg acc ctt gag caa tta act ttg gtt gaa agc aaa			2928
Gly Lys Glu Pro Val Thr Leu Glu Gln Leu Thr Leu Val Glu Ser Lys			
965	970	975	
gat aat aaa ccg tta tca gac aaa ctc aaa ttt act tta gaa aat gac			2976
Asp Asn Lys Pro Leu Ser Asp Lys Leu Lys Phe Thr Leu Glu Asn Asp			
980	985	990	
cac gtt gat gca ggt gca tta cgt tat aaa tta gtg aag aat aag ggc			3024
His Val Asp Ala Gly Ala Leu Arg Tyr Lys Leu Val Lys Asn Lys Gly			
995	1000	1005	
gaa ttc cgc ttg cat aac cca ata aaa gag cag gaa ttg cgc tct			3069
Glu Phe Arg Leu His Asn Pro Ile Lys Glu Gln Glu Leu Arg Ser			
1010	1015	1020	
gat tta gta aga gca gag caa gca gaa cga aca tta gaa gcc aaa			3114
Asp Leu Val Arg Ala Glu Gln Ala Glu Arg Thr Leu Glu Ala Lys			
1025	1030	1035	
caa gtt gaa cag act gct gaa aca caa aca agt aat gca aga gtg			3159
Gln Val Glu Gln Thr Ala Glu Thr Gln Thr Ser Asn Ala Arg Val			

1040	1045	1050	
cgg tca aga aga gcg gtg ttg	tct gat acc ccg tct	gct caa agc	3204
Arg Ser Arg Arg Ala Val Leu	Ser Asp Thr Pro Ser	Ala Gln Ser	
1055	1060	1065	
ctg tta aac gca tta gaa gtc	aaa caa gct gaa ccg	aat gct aaa	3249
Leu Leu Asn Ala Leu Glu Val	Lys Gln Ala Glu Pro	Asn Ala Lys	
1070	1075	1080	
aca caa aaa agt aag gca aaa	aca aaa aaa gcg ccg	tca aaa aga	3294
Thr Gln Lys Ser Lys Ala Lys	Thr Lys Lys Ala Arg	Ser Lys Arg	
1085	1090	1095	
gca ttg aga gaa gcg ttt tct	gat acc ccg cct gat	cta agc cag	3339
Ala Leu Arg Glu Ala Phe Ser	Asp Thr Pro Pro Asp	Leu Ser Gln	
1100	1105	1110	
tta aac gta tta gaa gcc gca	ctt aag gtt att aat	gcc caa ccg	3384
Leu Asn Val Leu Glu Ala Ala	Leu Lys Val Ile Asn	Ala Gln Pro	
1115	1120	1125	
caa aca gaa aaa gaa cgt caa	gct caa gag gaa gaa	gcg aaa aga	3429
Gln Thr Glu Lys Glu Arg Gln	Ala Gln Glu Glu Glu	Ala Lys Arg	
1130	1135	1140	
caa cgc aaa caa aaa gac ttg	atc agc cgt tac tca	aat agt gcg	3474
Gln Arg Lys Gln Lys Asp Leu	Ile Ser Arg Tyr Ser	Asn Ser Ala	
1145	1150	1155	
tta tcg gag ttg tct gca aca	gta aat agt atg ctt	tcc gtt caa	3519
Leu Ser Glu Leu Ser Ala Thr	Val Asn Ser Met Leu	Ser Val Gln	
1160	1165	1170	
gat gaa ttg gat cgt ctt ttt	gta gat caa gca caa	tct gcc ctg	3564
Asp Glu Leu Asp Arg Leu Phe	Val Asp Gln Ala Gln	Ser Ala Leu	
1175	1180	1185	
tgg aca aat atc gca cag gat	aaa aga cgc tat gat	tct gat gcg	3609
Trp Thr Asn Ile Ala Gln Asp	Lys Arg Arg Tyr Asp	Ser Asp Ala	
1190	1195	1200	
ttc cgt gct tat cag cag aaa	acg aac ttg cgt caa	att ggg gtg	3654
Phe Arg Ala Tyr Gln Gln Lys	Thr Asn Leu Arg Gln	Ile Gly Val	
1205	1210	1215	
caa aaa gcc tta gat aat gga	cga att ggg gcg gtt	ttc tcg cat	3699
Gln Lys Ala Leu Asp Asn Gly	Arg Ile Gly Ala Val	Phe Ser His	
1220	1225	1230	
agc cgt tca gat aat acc ttt	gac gaa cag gtt aaa	aat cac gcg	3744
Ser Arg Ser Asp Asn Thr Phe	Asp Glu Gln Val Lys	Asn His Ala	
1235	1240	1245	
aca tta acg atg atg tcg ggt	ttt gcc caa tat caa	tgg ggc gat	3789
Thr Leu Thr Met Met Ser Gly	Phe Ala Gln Tyr Gln	Trp Gly Asp	
1250	1255	1260	

tta caa	ttt ggt gta aac gtg	ggc gcg gga att agt	gcg agt aaa	3834
Leu Gln	Phe Gly Val Asn Val	Gly Ala Gly Ile Ser	Ala Ser Lys	
1265	1270	1275		
atg gct	gaa gaa caa agc cga	aaa att cat cga aaa	gcg ata aat	3879
Met Ala	Glu Glu Gln Ser Arg	Lys Ile His Arg Lys	Ala Ile Asn	
1280	1285	1290		
tat ggt	gtg aat gca agt tat	cag ttc cgt tta ggg	caa ttg ggt	3924
Tyr Gly	Val Asn Ala Ser Tyr	Gln Phe Arg Leu Gly	Gln Leu Gly	
1295	1300	1305		
att cag	cct tat ttg ggt gtt	aat cga tat ttt att	gaa cgt gaa	3969
Ile Gln	Pro Tyr Leu Gly Val	Asn Arg Tyr Phe Ile	Glu Arg Glu	
1310	1315	1320		
aat tat	caa tct gaa gaa gtg	aaa gtg caa aca ccg	agc ctt gca	4014
Asn Tyr	Gln Ser Glu Glu Val	Lys Val Gln Thr Pro	Ser Leu Ala	
1325	1330	1335		
ttt aat	cgc tat aat gct ggc	att cga gtt gat tat	aca ttt acc	4059
Phe Asn	Arg Tyr Asn Ala Gly	Ile Arg Val Asp Tyr	Thr Phe Thr	
1340	1345	1350		
ccg aca	gat aat atc agc gtt	aag cct tat ttc ttt	gtc aat tat	4104
Pro Thr	Asp Asn Ile Ser Val	Lys Pro Tyr Phe Phe	Val Asn Tyr	
1355	1360	1365		
gtt gat	gtt tca aac gct aac	gta caa acc act gta	aat agc acg	4149
Val Asp	Val Ser Asn Ala Asn	Val Gln Thr Thr Val	Asn Ser Thr	
1370	1375	1380		
atg ttg	caa caa tca ttt ggg	cgt tat tgg caa aaa	gaa gtg gga	4194
Met Leu	Gln Gln Ser Phe Gly	Arg Tyr Trp Gln Lys	Glu Val Gly	
1385	1390	1395		
tta aag	gca gaa att tta cat	ttc caa ctt tcc gct	ttt atc tca	4239
Leu Lys	Ala Glu Ile Leu His	Phe Gln Leu Ser Ala	Phe Ile Ser	
1400	1405	1410		
aaa tct	caa ggt tca caa ctc	ggt aaa cag caa aat	gtg ggc gtg	4284
Lys Ser	Gln Gly Ser Gln Leu	Gly Lys Gln Gln Asn	Val Gly Val	
1415	1420	1425		
aaa ttg	ggc tat cgt tgg taa			4305
Lys Leu	Gly Tyr Arg Trp			
1430				

<210> 9
 <211> 1434
 <212> PRT
 <213> Haemophilus influenzae

<220>
 <221> misc_feature

<222> (568)..(568)
<223> The 'Xaa' at location 568 stands for Ser, Gly, Arg, or Cys.

<220>
<221> misc_feature
<222> (1702)..(1702)
<223> "n" at position 1702 can be any base.

<400> 9

Met Lys Lys Thr Val Phe Arg Leu Asn Phe Leu Thr Ala Cys Ile Ser
1 5 10 15

Leu Gly Ile Val Ser Gln Ala Trp Ala Gly His Thr Tyr Phe Gly Ile
20 25 30

Asp Tyr Gln Tyr Tyr Arg Asp Phe Ala Glu Asn Glu Gly Lys Phe Ala
35 40 45

Val Gly Ala Lys Asn Ile Asp Val Tyr Asn Lys Glu Gly Gln Leu Val
50 55 60

Gly Thr Ser Met Thr Lys Ala Pro Met Ile Asp Phe Ser Val Val Ser
65 70 75 80

Arg Asn Gly Val Ala Ala Leu Val Gly Asp Gln Tyr Ile Val Ser Val
85 90 95

Ala His Asn Val Gly Tyr Thr Asn Val Asp Phe Gly Ala Glu Gly Gln
100 105 110

Asn Pro Asp Gln His Arg Phe Thr Tyr Lys Ile Val Lys Arg Asn Asn
115 120 125

Tyr Asn His Asp Ala Lys His Arg Tyr Leu Asp Asp Tyr His Asn Pro
130 135 140

Arg Leu His Lys Phe Val Thr Asp Ala Ala Pro Ile Asp Met Thr Ser
145 150 155 160

His Met Asp Gly Asn Lys Tyr Ala Asn Lys Glu Lys Tyr Pro Glu Arg
165 170 175

Val Arg Val Gly Ser Gly Asp Gln Tyr Trp Asp Asp Asp Gln Asn Asn
180 185 190

Arg Thr Tyr Leu Ser Asp Gly Tyr Asn Tyr Leu Thr Gly Gly Asn Thr
195 200 205

Tyr Asn Gln Ser Gly Arg Gly Asp Gly Tyr Ser Tyr Val Arg Gly Asp
210 215 220

Ile Arg Lys Val Gly Asp Tyr Gly Pro Leu Pro Ile Ala Ser Ser Phe
225 230 235 240

Gly Asp Ser Gly Ser Pro Met Phe Ile Tyr Asp Ala Glu Thr Gln Lys
245 250 255

Trp Leu Ile Asn Gly Val Leu Arg Glu Gly Gln Pro Tyr Thr Gly Glu
260 265 270

Phe Asp Gly Phe Gln Leu Ala Arg Lys Ser Phe Leu Asp Glu Ile Ile
275 280 285

Arg Lys Asp Gln Pro Asn Gly Phe Leu Thr Pro Lys Gly Asn Gly Val
290 295 300

Tyr Thr Ile Ser Lys Ser Asp Asp Gly Ile Gly Val Val Thr Ser Lys
305 310 315 320

Ile Gly Lys Pro Arg Glu Ile Pro Leu Ala Asn Asn Lys Leu Lys Ile
325 330 335

Glu Asp Lys Asp Thr Val Tyr Asn Asn Arg Tyr Asn Gly Pro Asn Ile
340 345 350

Tyr Ser Pro Gln Leu Asn Asn Gly Lys Asn Ile Tyr Phe Gly Asp Glu
355 360 365

Glu Leu Gly Ser Ile Thr Leu Thr Thr Asp Ile Asp Gln Gly Ala Gly
370 375 380

Gly Leu Tyr Phe Glu Gly Asp Phe Ile Val Ser Pro Thr Lys Asn Glu
385 390 395 400

Thr Trp Lys Gly Ala Gly Ile His Val Ser Glu Ile Ser Thr Val Thr
405 410 415

Trp Lys Val Asn Gly Val Glu Asn Asp Arg Leu Ser Lys Ile Gly Lys
420 425 430

Gly Thr Leu His Val Lys Ala Lys Gly Glu Asn Lys Gly Ser Ile Ser
435 440 445

Val Gly Asp Gly Lys Val Ile Leu Glu Gln Gln Ala Asp Asp Gln Gly
450 455 460

Asn Lys Gln Ala Phe Ser Glu Ile Gly Leu Val Ser Gly Arg Gly Thr
465 470 475 480

Val Gln Leu Asn Asp Asp Lys Gln Phe Asp Thr Asp Lys Phe Tyr Phe
485 490 495

Gly Phe Arg Gly Arg Leu Asp Leu Asn Gly His Ser Leu Thr Phe
500 505 510

Lys Arg Ile Gln Asn Thr Asp Glu Gly Ala Met Ile Val Asn His Asn
515 520 525

Thr Thr Gln Val Ala Asn Ile Thr Ile Thr Gly Asn Glu Ser Ile Thr
530 535 540

Ala Pro Ser Asn Lys Asn Asn Ile Asn Lys Leu Asp Tyr Ser Lys Glu
545 550 555 560

Ile Ala Tyr Asn Gly Trp Phe Xaa Glu Thr Asp Lys Asn Lys His Asn
565 570 575

Gly Arg Leu Asn Leu Ile Tyr Lys Pro Thr Thr Glu Asp Arg Thr Leu
580 585 590

Leu Leu Ser Gly Gly Thr Asn Leu Lys Gly Asp Ile Thr Gln Thr Lys
595 600 605

Gly Lys Leu Phe Phe Ser Gly Arg Pro Thr Pro His Ala Tyr Asn His
610 615 620

Leu Asp Lys Arg Trp Ser Glu Met Glu Gly Ile Pro Gln Gly Glu Ile
625 630 635 640

Val Trp Asp Tyr Asp Trp Ile Asn Arg Thr Phe Lys Ala Glu Asn Phe

645

650

655

Gln Ile Lys Gly Gly Ser Ala Val Val Ser Arg Asn Val Ser Ser Ile
660 665 670

Glu Gly Asn Trp Thr Val Ser Asn Asn Ala Asn Ala Thr Phe Gly Val
675 680 685

Val Pro Asn Gln Gln Asn Thr Ile Cys Thr Arg Ser Asp Trp Thr Gly
690 695 700

Leu Thr Thr Cys Lys Thr Val Asn Leu Thr Asp Lys Lys Val Ile Asp
705 710 715 720

Ser Ile Pro Thr Thr Gln Ile Asn Gly Ser Ile Asn Leu Thr Asp Asn
725 730 735

Ala Thr Val Asn Ile Asn Gly Leu Ala Lys Leu Asn Gly Asn Val Thr
740 745 750

Leu Ile Asn His Ser Gln Phe Thr Leu Ser Asn Asn Ala Thr Gln Ile
755 760 765

Gly Asn Ile Lys Leu Ser Asn His Ala Asn Ala Arg Val Asn Asn Ala
770 775 780

Thr Leu Met Gly Asp Val Asn Leu Ala Asp Thr Ser Arg Phe Thr Leu
785 790 795 800

Ser Asn Gln Ala Thr Gln Ile Gly Thr Ile Ser Leu His Gln Gln Ala
805 810 815

Gln Ala Thr Val Asp Asn Ala Asn Leu Asn Gly Asn Val His Leu Thr
820 825 830

Asp Ser Ala Arg Phe Ser Leu Lys Asn Ser His Phe Ser His Gln Ile
835 840 845

Gln Gly Asp Lys Asp Thr Thr Val Thr Leu Glu Asn Ala Thr Trp Thr
850 855 860

Met Pro Ser Asp Thr Thr Leu Gln Asn Leu Thr Leu Asn Asn Ser Thr
865 870 875 880

Val Thr Leu Asn Ser Ala Tyr Ser Ala Ser Ser Asn Asn Ala Pro Arg
885 890 895

Arg Arg Arg Ser Leu Glu Thr Glu Thr Thr Pro Thr Ser Ala Glu His
900 905 910

Arg Phe Asn Thr Leu Thr Val Asn Gly Lys Leu Ser Gly Gln Gly Thr
915 920 925

Phe Gln Phe Thr Pro Ser Leu Phe Gly Tyr Glu Ser Asp Lys Leu Lys
930 935 940

Leu Ser Asn Asp Ala Glu Gly Asp Tyr Thr Leu Ser Val Arg Asn Thr
945 950 955 960

Gly Lys Glu Pro Val Thr Leu Glu Gln Leu Thr Leu Val Glu Ser Lys
965 970 975

Asp Asn Lys Pro Leu Ser Asp Lys Leu Lys Phe Thr Leu Glu Asn Asp
980 985 990

His Val Asp Ala Gly Ala Leu Arg Tyr Lys Leu Val Lys Asn Lys Gly
995 1000 1005

Glu Phe Arg Leu His Asn Pro Ile Lys Glu Gln Glu Leu Arg Ser
1010 1015 1020

Asp Leu Val Arg Ala Glu Gln Ala Glu Arg Thr Leu Glu Ala Lys
1025 1030 1035

Gln Val Glu Gln Thr Ala Glu Thr Gln Thr Ser Asn Ala Arg Val
1040 1045 1050

Arg Ser Arg Arg Ala Val Leu Ser Asp Thr Pro Ser Ala Gln Ser
1055 1060 1065

Leu Leu Asn Ala Leu Glu Val Lys Gln Ala Glu Pro Asn Ala Lys
1070 1075 1080

Thr Gln Lys Ser Lys Ala Lys Thr Lys Lys Ala Arg Ser Lys Arg
1085 1090 1095

Ala Leu Arg Glu Ala Phe Ser Asp Thr Pro Pro Asp Leu Ser Gln
1100 1105 1110

Leu Asn Val Leu Glu Ala Ala Leu Lys Val Ile Asn Ala Gln Pro
1115 1120 1125

Gln Thr Glu Lys Glu Arg Gln Ala Gln Glu Glu Glu Ala Lys Arg
1130 1135 1140

Gln Arg Lys Gln Lys Asp Leu Ile Ser Arg Tyr Ser Asn Ser Ala
1145 1150 1155

Leu Ser Glu Leu Ser Ala Thr Val Asn Ser Met Leu Ser Val Gln
1160 1165 1170

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Val Asp Val Ser Asn Ala Asn Val Gln Thr Thr Val Asn Ser Thr
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gat cgc tta tcc aaa att ggg ctg gga acc tta ctt gtt aat ggt aaa	1765

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Gly Lys Asn Leu Gly Ser Leu Ser Val Gly Asn Gly Leu Val Val Leu			
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Asp Gln Gln Ala Asp Glu Ser Gly Gln Lys Gln Ala Phe Lys Glu Val			
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Gly Ile Val Ser Gly Arg Ala Thr Val Gln Leu Asn Ser Ala Asp Gln			
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Val Asp Pro Asn Asn Ile Tyr Phe Gly Phe Arg Gly Arg Leu Asp			
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ctt aat ggg cat tca tta acc ttt gaa cgt atc caa aat acg gat gaa		2005	
Leu Asn Gly His Ser Leu Thr Phe Glu Arg Ile Gln Asn Thr Asp Glu			
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Gly Ala Met Ile Val Asn His Asn Ala Ser Gln Thr Ala Asn Ile Thr			
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Ile Thr Gly Asn Ala Thr Ile Asn Ser Asp Ser Lys Gln Leu Thr Asn			
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aaa aaa gat att gca ttt aac ggc tgg ttt ggt gag caa gat aaa gct		2149	
Lys Lys Asp Ile Ala Phe Asn Gly Trp Phe Gly Glu Gln Asp Lys Ala			
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Lys Thr Asn Gly Arg Leu Asn Val Asn Tyr Gln Pro Val Asn Ala Glu			
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Asn His Leu Leu Ser Gly Gly Thr Asn Leu Asn Gly Asn Ile Thr			
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Gln Asn Gly Gly Thr Leu Val Phe Ser Gly Arg Pro Thr Pro His Ala			
610	615	620	
tac aat cat tta aga aga gac ttg tct aac atg gaa ggt atc cca caa		2341	
Tyr Asn His Leu Arg Arg Asp Leu Ser Asn Met Glu Gly Ile Pro Gln			
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ggc gaa att gtg tgg gat cac gat tgg atc aac cgc aca ttt aaa gct		2389	
Gly Glu Ile Val Trp Asp His Asp Trp Ile Asn Arg Thr Phe Lys Ala			
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Glu Asn Phe Gln Ile Lys Gly Gly Ser Ala Val Val Ser Arg Asn Val			

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acc caa aca ggc aat atc aaa ctt tca aat cac gca aat gca acg gtg Thr Gln Thr Gly Asn Ile Lys Leu Ser Asn His Ala Asn Ala Thr Val 770	775	780	2773
gac aat gca aat ttg aac ggt aat gtg aat tta atg gat tct gct caa Asp Asn Ala Asn Leu Asn Gly Asn Val Asn Leu Met Asp Ser Ala Gln 785	790	795	800
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gac aca aca gtg atg ttg gaa aat gcg act tgg aca atg cct agc gat Asp Thr Thr Val Met Leu Glu Asn Ala Thr Trp Thr Met Pro Ser Asp 820	825	830	2917
acc aca ttg cag aat tta acg cta aat aat agt act gtt acg tta aat Thr Thr Leu Gln Asn Leu Thr Leu Asn Asn Ser Thr Val Thr Leu Asn 835	840	845	2965
tca gct tat tca gct atc tca aat aat gcg cca cgc cgt cgc cgc cgt Ser Ala Tyr Ser Ala Ile Ser Asn Asn Ala Pro Arg Arg Arg Arg Arg 850	855	860	3013
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Thr Ser Ser Leu Phe Gly Tyr Lys Ser Asp Lys Leu Lys Leu Ser Asn	
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Asp Ala Glu Gly Asp Tyr Thr Leu Ser Val Arg Asn Thr Gly Lys Glu	
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Pro Val Thr Phe Gly Gln Leu Thr Leu Val Glu Ser Lys Asp Asn Lys	
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Pro Leu Ser Asp Lys Leu Thr Phe Thr Leu Glu Asn Asp His Val Asp	
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Leu Pro Asp Gln Ile Leu Gln Ala Ala Leu Glu Val Ile Asp Ala	
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Asp	Ala	Phe	Arg	Ala	Tyr	Gln	Gln	Lys	Thr	Asn	Leu	Arg	Gln	Ile	
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Gly	Val	Gln	Lys	Ala	Leu	Asp	Asn	Gly	Arg	Ile	Gly	Ala	Val	Phe	
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Ser	His	Ser	Arg	Ser	Asp	Asn	Thr	Phe	Asp	Glu	Gln	Val	Lys	Asn	
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1280							1285					1290			
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Leu	Val	Phe	Asn	Arg	Tyr	Asn	Ala	Gly	Ile	Arg	Val	Asp	Tyr	Thr	
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Gly	Thr	Met	Met	Lys	Gly	Val	Pro	Met	Pro	Asp	Leu	Ser	Ser	Met	Val
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Arg	Gly	Gly	Tyr	Ser	Thr	Leu	Ile	Ser	Glu	Gln	His	Leu	Ile	Ser	Val
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Ala	His	Asn	Val	Gly	Tyr	Asp	Val	Val	Asp	Phe	Gly	Met	Glu	Gly	Glu
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Asn	Pro	Asp	Gln	His	Arg	Phe	Lys	Tyr	Lys	Val	Val	Lys	Arg	Tyr	Asn
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Tyr Lys Ser Gly Asp Arg Gln Tyr Asn Asp Tyr Gln His Pro Arg Leu
130 135 140

Glu Lys Phe Val Thr Glu Thr Ala Pro Ile Glu Met Val Ser Tyr Met
145 150 155 160

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165 170 175

Val Gly Ser Gly His Gln Trp Trp Lys Asp Asp Asn Asn Lys Thr Ile
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Gly Asp Leu Ala Tyr Gly Ser Trp Leu Ile Gly Gly Asn Thr Phe
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Glu Asp Gly Pro Ala Gly Asn Gly Thr Leu Glu Leu Asn Gly Arg Val
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Gln Asn Pro Asn Lys Tyr Gly Pro Leu Pro Thr Ala Gly Ser Phe Gly
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Asp Ser Gly Ser Pro Met Phe Ile Tyr Asp Lys Glu Val Lys Lys Trp
245 250 255

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Asn Ser Tyr Gln Ile Thr Arg Lys Asp Tyr Phe Gln Gly Ile Leu Asn
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305 310 315 320

Leu Pro Lys Lys Ala Ile Gln Pro Glu Arg Ile Val Gly Leu Tyr Asp
325 330 335

Asn Ser Gln Leu His Asp Ala Arg Asp Lys Asn Gly Asp Glu Ser Pro
340 345 350

Ser Tyr Lys Gly Pro Asn Pro Trp Ser Pro Ala Leu His His Gly Lys
355 360 365

Ser Ile Tyr Phe Gly Asp Gln Gly Thr Gly Thr Leu Thr Ile Glu Asn
370 375 380

Asn Ile Asn Gln Gly Ala Gly Gly Leu Tyr Phe Glu Gly Asn Phe Val
385 390 395 400

Val Lys Gly Asn Gln Asn Asn Ile Thr Trp Gln Gly Ala Gly Val Ser
405 410 415

Val Gly Glu Glu Ser Thr Val Glu Trp Gln Val His Asn Pro Glu Gly
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815

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Ser Ala Val Val Ser Arg Asn Val Ser Ser Ile Glu Gly Asn Trp Thr			
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Val Ser Asn Asn Ala Asn Ala Phe Gly Val Val Pro Asn Gln Gln			
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Asn Thr Ile Cys Thr Arg Ser Asp Trp Thr Gly Leu Thr Thr Cys Lys			
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Thr Val Asp Leu Thr Asp Thr Lys Val Ile Asn Ser Ile Pro Thr Thr			
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Gln Ile Asn Gly Ser Ile Asn Leu Thr Asp Asn Ala Thr Val Asn Ile			
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Gln Phe Thr Leu Ser Asn Asn Ala Thr Gln Thr Gly Asn Ile Gln Leu			
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Val His Leu Thr Asp Ser Ala Gln Phe Ser Leu Lys Asn Ser His Phe			
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Val Gly Ala Lys Asn Ile Glu Val Tyr Asn Lys Glu Gly Thr Leu Val
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Gly Thr Ser Met Thr Lys Ala Pro Met Ile Asp Phe Ser Val Val Ser
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Arg Asn Gly Val Ala Ala Leu Val Gly Asp Gln Tyr Ile Val Ser Val
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Ala His Asn Gly Gly Tyr Asn Ser Val Asp Phe Gly Ala Glu Gly Pro
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Asn Pro Asp Gln His Arg Phe Thr Tyr Gln Ile Val Lys Arg Asn Asn
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Tyr Lys Pro Gly Lys Asp Asn Pro Tyr His Gly Asp Tyr His Met Pro
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Arg Leu His Lys Phe Val Thr Asp Ala Glu Pro Ala Lys Met Thr Asp
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Asn Met Asn Gly Lys Asn Tyr Ala Asp Leu Ser Lys Tyr Pro Asp Arg
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Val Arg Ile Gly Thr Gly Glu Gln Trp Trp Arg Thr Asp Glu Glu Gln
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Lys Gln Gly Ser Lys Ser Ser Trp Leu Ala Asp Ala Tyr Leu Trp Arg
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Ile Ala Gly Asn Thr His Ser Gln Ser Gly Ala Gly Asn Gly Thr Val
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Asn Leu Ser Gly Asp Ile Thr Lys Pro Asn Asn Tyr Gly Pro Leu Pro
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Thr Gly Val Ser Phe Gly Asp Ser Gly Ser Pro Met Phe Ile Tyr Asp
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Ala Ile Lys Gln Lys Trp Leu Ile Asn Gly Val Leu Gln Thr Gly Asn
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Pro Phe Ser Gly Ala Gly Asn Gly Phe Gln Leu Ile Arg Lys Asn Trp
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Phe Tyr Asp Asn Val Phe Val Glu Asp Leu Pro Ile Thr Phe Leu Glu
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Pro Arg Ser Asn Gly His Tyr Ser Phe Thr Ser Asn Asn Asn Gly Thr
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Gly Thr Val Thr Gln Thr Asn Glu Lys Val Ser Met Pro Gln Phe Lys
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Val Arg Thr Val Gln Leu Phe Asn Glu Ala Leu Lys Glu Lys Asp Lys
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Glu Pro Val Tyr Ala Ala Gly Gly Val Asn Ala Tyr Lys Pro Arg Leu
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Asn Asn Gly Lys Asn Ile Tyr Phe Gly Asp Arg Gly Thr Gly Thr Leu
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Thr Ile Glu Asn Asn Ile Asn Gln Gly Ala Gly Gly Leu Tyr Phe Glu
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Gly Val His Val Gly Glu Asp Ser Thr Val Thr Trp Lys Val Asn Gly
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Val Glu His Asp Arg Leu Ser Lys Ile Gly Lys Gly Thr Leu His Ile

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440

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Gln Ala Lys Gly Glu Asn Leu Gly Ser Ile Ser Val Gly Asp Gly Lys
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Lys Glu Val Gly Ile Val Ser Gly Arg Ala Thr Val Gln Leu Asn Ser
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Ala Asp Gln Val Asp Pro Asn Asn Ile Tyr Phe Gly Phe Arg Gly Gly
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Arg Leu Asp Leu Asn Gly His Ser Leu Thr Phe Lys Arg Ile Gln Asn
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Thr Asp Glu Gly Ala Met Ile Val Asn His Asn Thr Thr Gln Val Ala
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Trp Phe Gly Glu Thr Asp Glu Asn Lys His Asn Gly Arg Leu Asn Leu
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Ile Tyr Lys Pro Thr Thr Glu Asp Arg Thr Leu Leu Leu Ser Gly Gly
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Ser Gly Arg Pro Thr Pro His Ala Tyr Asn His Leu Asn Arg Pro Asn
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Glu Leu Gly Arg Pro Gln Gly Glu Val Val Ile Asp Asp Asp Trp Ile
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Thr Arg Thr Phe Lys Ala Glu Asn Phe Gln Ile Lys Gly Gly Ser Ala
660 665 670

Val Val Ser Arg Asn Val Ser Ser Ile Glu Gly Asn Trp Thr Val Ser
675 680 685

Asn Asn Ala Asn Ala Ala Phe Gly Val Val Pro Asn Gln Gln Asn Thr
690 695 700

Ile Cys Thr Arg Ser Asp Trp Thr Gly Leu Thr Thr Cys Lys Thr Val
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Asp Leu Thr Asp Thr Lys Val Ile Asn Ser Ile Pro Thr Thr Gln Ile
725 730 735

Asn Gly Ser Ile Asn Leu Thr Asp Asn Ala Thr Val Asn Ile His Gly
740 745 750

Leu Ala Lys Leu Asn Gly Asn Val Thr Leu Ile Asn His Ser Gln Phe
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Thr Leu Ser Asn Asn Ala Thr Gln Thr Gly Asn Ile Gln Leu Ser Asn
770 775 780

His Ala Asn Ala Thr Val Asp Asn Ala Asn Leu Asn Gly Asn Val His
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Gln Ile Gln Gly Asp Lys Asp Thr Thr Val Thr Leu Glu Asn Ala Thr
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Trp Thr Met Pro Ser Asp Ala Thr Leu Gln Asn Leu Thr Leu Asn Asn
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Ser Thr Val Thr Leu Asn Ser Ala Tyr Ser Ala Ser Ser Asn Asn Ala
850 855 860

Pro Arg His Arg Arg Ser Leu Glu Thr Glu Thr Thr Pro Thr Ser Ala
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Glu His Arg Phe Asn Thr Leu Thr Val Asn Gly Lys Leu Ser Gly Gln
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Gly Thr Phe Gln Phe Thr Ser Ser Leu Phe Gly Tyr Lys Ser Asp Lys
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Ser Lys Asp Asn Lys Pro Leu Ser Asp Lys Leu Lys Phe Thr Leu Glu
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Asn Asp His Val Asp Ala Gly Ala Leu Arg Tyr Lys Leu Val Lys Asn
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Asn Gly Glu Phe Arg Leu His Asn Pro Ile Lys Glu Gln Glu Leu Arg
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Asn Asp Leu Val Arg Ala Glu Gln Ala Glu Arg Thr Leu Glu Ala Lys
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His Ala Thr Leu Thr Met Met Ser Gly Phe Ala Gln Tyr Gln Trp
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Gly Asp Leu Gln Phe Gly Val Asn Val Gly Thr Gly Ile Ser Ala
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Ser Lys Met Ala Glu Glu Gln Ser Arg Lys Ile His Arg Lys Ala
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Ile Asn Tyr Gly Val Asn Ala Ser Tyr Gln Phe Arg Leu Gly Gln
1295 1300 1305

Leu Gly Ile Gln Pro Tyr Phe Gly Val Asn Arg Tyr Phe Ile Glu
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Arg Glu Asn Tyr Gln Ser Glu Glu Val Lys Val Lys Thr Pro Ser

1325

1330

1335

Leu Ala Phe Asn Arg Tyr Asn Ala Gly Ile Arg Val Asp Tyr Thr
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Phe Thr Pro Thr Asp Asn Ile Ser Val Lys Pro Tyr Phe Phe Val
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Asn Tyr Val Asp Val Ser Asn Ala Asn Val Gln Thr Thr Val Asn
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Ser Thr Val Leu Gln Gln Pro Phe Gly Arg Tyr Trp Gln Lys Glu
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Val Gly Leu Lys Ala Glu Ile Leu His Phe Gln Leu Ser Ala Phe
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Met Lys Thr Val Phe Arg Leu Asn

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15	20	25	
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50	55		
aat aaa aaa ggg gaa atg ata ggt acg atg atg aaa ggt gtg cct atg Asn Lys Lys Gly Glu Met Ile Gly Thr Met Met Lys Gly Val Pro Met	60	65	606
65	70		
cct gat tta tct tcc atg gtt cgt ggt tat tca aca ttg ata agt Pro Asp Leu Ser Ser Met Val Arg Gly Gly Tyr Ser Thr Leu Ile Ser	75	80	654
80	85		
gag cag cat tta att agc gtc gca cat aat gta ggg tat gat gtc gtt Glu Gln His Leu Ile Ser Val Ala His Asn Val Gly Tyr Asp Val Val	90	95	702
95	100	105	
gat ttt ggt atg gag ggg gaa aat cca gac caa cat cgt ttt aag tat Asp Phe Gly Met Glu Gly Glu Asn Pro Asp Gln His Arg Phe Lys Tyr	110	115	750
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130	135		
gat tat caa cat cca aga tta gag aaa ttt gta acg gaa act gca cct Asp Tyr Gln His Pro Arg Leu Glu Lys Phe Val Thr Glu Thr Ala Pro	140	145	846
145	150		
att gaa atg gtt tca tat atg gat ggt aat cat tac aaa aat ttt aat Ile Glu Met Val Ser Tyr Met Asp Gly Asn His Tyr Lys Asn Phe Asn	155	160	894
160	165		
caa tat cct ttg cga gtt aga gtt gga agt ggg cat caa tgg tgg aaa Gln Tyr Pro Leu Arg Val Arg Val Gly Ser Gly His Gln Trp Trp Lys	170	175	942
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gac gat aat aat aaa acc att gga gac tta gcc tat gga ggt tca tgg Asp Asp Asn Asn Lys Thr Ile Gly Asp Leu Ala Tyr Gly Ser Trp	190	195	990
195	200		
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210	215		
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225	230		

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cca gca tta cat cat ggg aaa agt att tac ttt ggc gat caa gga aca Pro Ala Leu His His Gly Lys Ser Ile Tyr Phe Gly Asp Gln Gly Thr 365 370 375	1518
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700	705	710	
gtt gat tta acc gat aaa aaa gtt att aat tcc ata ccg aca aca caa	2574		
Val Asp Leu Thr Asp Lys Lys Val Ile Asn Ser Ile Pro Thr Thr Gln			
715	720	725	
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Ile Asn Gly Ser Ile Asn Leu Thr Asp Asn Ala Thr Val Asn Ile His			
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ggt tta gca aaa ctt aat ggt aat gtc act tta ata gat cac agc caa	2670		
Gly Leu Ala Lys Leu Asn Gly Asn Val Thr Leu Ile Asp His Ser Gln			
750	755	760	
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Phe Thr Leu Ser Asn Asn Ala Thr Gln Ala Gly Asn Ile Lys Leu Ser			
765	770	775	
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780	785	790	
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His Gln Ile Gln Gly Glu Asp Thr Thr Val Met Leu Glu Asn Ala			
810	815	820	825
act tgg aca atg cct agc gat acc aca ttg cag aat tta acg cta aat	2910		
Thr Trp Thr Met Pro Ser Asp Thr Thr Leu Gln Asn Leu Thr Leu Asn			
830	835	840	
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tcg gca gaa cat cgt ttc aac aca ttg aca gta aat ggt aaa ttg agc	3054		
Ser Ala Glu His Arg Phe Asn Thr Leu Thr Val Asn Gly Lys Leu Ser			
875	880	885	
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Gly Gln Gly Thr Phe Gln Phe Thr Ser Ser Leu Phe Gly Tyr Lys Ser			
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Asp Lys Leu Lys Leu Ser Asn Asp Ala Glu Gly Asp Tyr Thr Leu Ser			

910	915	920	
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tta gaa aat gac cac gtt gat gca ggt gca tta cgt tat aaa tta gtg Leu Glu Asn Asp His Val Asp Ala Gly Ala Leu Arg Tyr Lys Leu Val 955	960	965	3294
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1140	1145	1150		
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1155	1160	1165		
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Lys Thr Asn Leu	Arg Gln Ile Gly Val	Gln Lys Ala Leu Asp	Asn	
1170	1175	1180		
gga cga att ggg	gcf gtt ttc tcg cat	agc cgt tca gat aat	acc	3975
Gly Arg Ile Gly	Ala Val Phe Ser His	Ser Arg Ser Asp Asn	Thr	
1185	1190	1195		
ttt gac gaa cag	gtt aaa aat cac gcg	aca tta gcg atg atg	tct	4020
Phe Asp Glu Gln	Val Lys Asn His Ala	Thr Leu Ala Met Met	Ser	
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ggf ttt gcc caa	tat caa tgg ggc gat	tta caa ttt ggt gta	aac	4065
Gly Phe Ala Gln	Tyr Gln Trp Gly Asp	Leu Gln Phe Gly Val	Asn	
1215	1220	1225		
gtg ggt gcg gga	att agt gcg agt aaa	atg gct gaa gaa caa	agc	4110
Val Gly Ala Gly	Ile Ser Ala Ser Lys	Met Ala Glu Glu Gln	Ser	
1230	1235	1240		
cga aaa att cat	cga aaa gcg ata aat	tat ggt gtg aat gca	agt	4155
Arg Lys Ile His	Arg Lys Ala Ile Asn	Tyr Gly Val Asn Ala	Ser	
1245	1250	1255		
tat cag ttc cgt	tta ggg caa ttg ggt	att cag cct tat ttg	ggt	4200
Tyr Gln Phe Arg	Leu Gly Gln Leu Gly	Ile Gln Pro Tyr Leu	Gly	
1260	1265	1270		
gtt aat cga tat	ttt att gaa cgt gaa	aat tat caa tct gaa	gaa	4245
Val Asn Arg Tyr	Phe Ile Glu Arg Glu	Asn Tyr Gln Ser Glu	Glu	
1275	1280	1285		
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Val Lys Val Gln	Thr Pro Ser Leu Val	Phe Asn Arg Tyr Asn	Ala	
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ggc att cga gtt	gat tat aca ttt acc	ccg aca gat aat atc	agc	4335
Gly Ile Arg Val	Asp Tyr Thr Phe Thr	Pro Thr Asp Asn Ile	Ser	
1305	1310	1315		
att aag cct tat	ttc ttc gtc aat tat	gtt gat gtt tca aac	gct	4380
Ile Lys Pro Tyr	Phe Phe Val Asn Tyr	Val Asp Val Ser Asn	Ala	
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aac gta caa acc	act gta aat cgc acg	atg ttg caa caa tca	ttt	4425
Asn Val Gln Thr	Thr Val Asn Arg Thr	Met Leu Gln Gln Ser	Phe	
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Gly Arg Tyr Trp Gln Lys Glu Val Gly Leu Lys Ala Glu Ile Leu	
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cat ttc caa ctt tcc gct ttt atc tca aaa tct caa ggt tca caa	4515
His Phe Gln Leu Ser Ala Phe Ile Ser Lys Ser Gln Gly Ser Gln	
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ctc ggc aaa cag caa aat gtg ggc gtg aaa ttg ggg tat cgt tgg	4560
Leu Gly Lys Gln Gln Asn Val Gly Val Lys Leu Gly Tyr Arg Trp	
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atcctacctt ttttattcca ataatggaac tttattttat taaaggtatc taagtagcac	4673
cctatatagg gattaattaa gaggattaa taatgaattt aactaaaatt ttacccacat	4733
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Asp Tyr Gln Tyr Tyr Arg Asp Phe Ala Glu Asn Lys Gly Lys Phe Thr	
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Val Gly Ala Gln Asp Ile Asp Ile Tyr Asn Lys Lys Gly Glu Met Ile	
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Gly Thr Met Met Lys Gly Val Pro Met Pro Asp Leu Ser Ser Met Val	
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Arg Gly Gly Tyr Ser Thr Leu Ile Ser Glu Gln His Leu Ile Ser Val	
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Ala His Asn Val Gly Tyr Asp Val Val Asp Phe Gly Met Glu Gly Glu	
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Asn Pro Asp Gln His Arg Phe Lys Tyr Lys Val Val Lys Arg Tyr Asn
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Tyr Lys Ser Gly Asp Arg Gln Tyr Asn Asp Tyr Gln His Pro Arg Leu
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Glu Lys Phe Val Thr Glu Thr Ala Pro Ile Glu Met Val Ser Tyr Met
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Asp Gly Asn His Tyr Lys Asn Phe Asn Gln Tyr Pro Leu Arg Val Arg
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Val Gly Ser Gly His Gln Trp Trp Lys Asp Asp Asn Asn Lys Thr Ile
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Gly Asp Leu Ala Tyr Gly Ser Trp Leu Ile Gly Gly Asn Thr Phe
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Glu Asp Gly Pro Ala Gly Asn Gly Thr Leu Glu Leu Asn Gly Arg Val
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Gln Asn Pro Asn Lys Tyr Gly Pro Leu Pro Thr Ala Gly Ser Phe Gly
225 230 235 240

Asp Ser Gly Ser Pro Met Phe Ile Tyr Asp Lys Glu Val Lys Lys Trp
245 250 255

Leu Leu Asn Gly Val Leu Arg Glu Gly Asn Pro Tyr Ala Ala Val Gly
260 265 270

Asn Ser Tyr Gln Ile Thr Arg Lys Asp Tyr Phe Gln Gly Ile Leu Asn
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Gln Asp Ile Thr Ala Asn Phe Trp Asp Thr Asn Ala Glu Tyr Arg Phe
290 295 300

Asn Ile Gly Ser Asp His Asn Gly Arg Val Ala Thr Ile Lys Ser Thr
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Leu Pro Lys Lys Ala Ile Gln Pro Glu Arg Ile Val Gly Leu Tyr Asp
325 330 335

Asn Ser Gln Leu His Asp Ala Arg Asp Lys Asn Gly Asp Glu Ser Pro
340 345 350

Ser Tyr Lys Gly Pro Asn Pro Trp Ser Pro Ala Leu His His Gly Lys
355 360 365

Ser Ile Tyr Phe Gly Asp Gln Gly Thr Gly Thr Leu Thr Ile Glu Asn
370 375 380

Asn Ile Asn Gln Gly Ala Gly Gly Leu Tyr Phe Glu Gly Asn Phe Val
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Val Lys Gly Asn Gln Asn Asn Ile Thr Trp Gln Gly Ala Gly Val Ser
405 410 415

Val Gly Glu Glu Ser Thr Val Glu Trp Gln Val His Asn Pro Glu Gly
420 425 430

Asp Arg Leu Ser Lys Ile Gly Leu Gly Thr Leu Leu Val Asn Gly Lys
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Gly Lys Asn Leu Gly Ser Leu Ser Val Gly Asn Gly Leu Val Val Leu
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Asp Gln Gln Ala Asp Glu Ser Gly Gln Lys Gln Ala Phe Lys Glu Val
465 470 475 480

Gly Ile Val Ser Gly Arg Ala Thr Val Gln Leu Asn Ser Ala Asp Gln
485 490 495

Val Asp Pro Asn Asn Ile Tyr Phe Gly Phe Arg Gly Gly Arg Leu Asp
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Leu Asn Gly His Ser Leu Thr Phe Glu Arg Ile Gln Asn Thr Asp Glu
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Gly Ala Met Ile Val Asn His Asn Ala Ser Gln Thr Ala Asn Ile Thr
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Ile Thr Gly Asn Ala Thr Ile Asn Ser Asp Ser Lys Gln Leu Thr Asn
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Lys Lys Asp Ile Ala Phe Asn Gly Trp Phe Gly Glu Gln Asp Lys Ala

565

570

575

Lys Thr Asn Gly Arg Leu Asn Val Asn Tyr Gln Pro Val Asn Ala Glu
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Asn His Leu Leu Leu Ser Gly Gly Thr Asn Leu Asn Gly Asn Ile Thr
595 600 605

Gln Asn Gly Gly Thr Leu Val Phe Ser Gly Arg Pro Thr Pro His Ala
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Tyr Asn His Leu Arg Arg Asp Leu Ser Asn Met Glu Gly Ile Pro Gln
625 630 635 640

Gly Glu Ile Val Trp Asp His Asp Trp Ile Asn Arg Thr Phe Lys Ala
645 650 655

Glu Asn Phe Gln Ile Lys Gly Gly Ser Ala Val Val Ser Arg Asn Val
660 665 670

Ser Ser Ile Glu Gly Asn Trp Thr Val Ser Asn Asn Ala Asn Ala Thr
675 680 685

Phe Gly Val Val Pro Asn Gln Gln Asn Thr Ile Cys Thr Arg Ser Asp
690 695 700

Trp Thr Gly Leu Thr Thr Cys Lys Thr Val Asp Leu Thr Asp Lys Lys
705 710 715 720

Val Ile Asn Ser Ile Pro Thr Thr Gln Ile Asn Gly Ser Ile Asn Leu
725 730 735

Thr Asp Asn Ala Thr Val Asn Ile His Gly Leu Ala Lys Leu Asn Gly
740 745 750

Asn Val Thr Leu Ile Asp His Ser Gln Phe Thr Leu Ser Asn Asn Ala
755 760 765

Thr Gln Ala Gly Asn Ile Lys Leu Ser Asn His Ala Asn Ala Thr Val
770 775 780

Asp Asn Ala Asn Leu Asn Gly Asn Val Asn Leu Met Asp Ser Ala Gln
785 790 795 800

Phe Ser Leu Lys Asn Ser His Phe Ser His Gln Ile Gln Gly Gly Glu
805 810 815

Asp Thr Thr Val Met Leu Glu Asn Ala Thr Trp Thr Met Pro Ser Asp
820 825 830

Thr Thr Leu Gln Asn Leu Thr Leu Asn Asn Ser Thr Val Thr Leu Asn
835 840 845

Ser Ala Tyr Ser Ala Ile Ser Asn Asn Ala Pro Arg Arg Arg Arg Arg
850 855 860

Ser Leu Glu Thr Glu Thr Thr Pro Thr Ser Ala Glu His Arg Phe Asn
865 870 875 880

Thr Leu Thr Val Asn Gly Lys Leu Ser Gly Gln Gly Thr Phe Gln Phe
885 890 895

Thr Ser Ser Leu Phe Gly Tyr Lys Ser Asp Lys Leu Lys Leu Ser Asn
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Asp Ala Glu Gly Asp Tyr Thr Leu Ser Val Arg Asn Thr Gly Lys Glu
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Pro Val Thr Phe Gly Gln Leu Thr Leu Val Glu Ser Lys Asp Asn Lys
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Pro Leu Ser Asp Lys Leu Thr Phe Thr Leu Glu Asn Asp His Val Asp
945 950 955 960

Ala Gly Ala Leu Arg Tyr Lys Leu Val Lys Asn Asp Gly Glu Phe Arg
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Leu His Asn Pro Ile Lys Glu Gln Glu Leu Arg Ser Asp Leu Val Arg
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Ala Glu Gln Ala Glu Arg Thr Leu Glu Ala Lys Gln Val Glu Gln Thr
995 1000 1005

Ala Lys Thr Gln Thr Ser Lys Ala Arg Val Arg Ser Arg Arg Ala
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Val Phe Ser Asp Pro Leu Pro Ala Gln Ser Leu Leu Asn Ala Leu
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Glu Ala Lys Gln Ala Leu Thr Thr Glu Thr Gln Thr Ser Lys Ala
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Lys Lys Val Arg Ser Lys Arg Ala Ala Arg Glu Phe Ser Asp Thr
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Leu Pro Asp Gln Ile Leu Gln Ala Ala Leu Glu Val Ile Asp Ala
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Gln Gln Gln Val Lys Lys Glu Pro Gln Thr Gln Glu Glu Glu Glu
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Lys Arg Gln Arg Lys Gln Lys Glu Leu Ile Ser Arg Tyr Ser Asn
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Ser Ala Leu Ser Glu Leu Ser Ala Thr Val Asn Ser Met Leu Ser
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Val Gln Asp Glu Leu Asp Arg Leu Phe Val Asp Gln Ala Gln Ser
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Ala Val Trp Thr Asn Ile Ala Gln Asp Lys Arg Arg Tyr Asp Ser
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Asp Ala Phe Arg Ala Tyr Gln Gln Lys Thr Asn Leu Arg Gln Ile
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Gly Val Gln Lys Ala Leu Asp Asn Gly Arg Ile Gly Ala Val Phe
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Ser His Ser Arg Ser Asp Asn Thr Phe Asp Glu Gln Val Lys Asn
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His Ala Thr Leu Ala Met Met Ser Gly Phe Ala Gln Tyr Gln Trp
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Gly Asp Leu Gln Phe Gly Val Asn Val Gly Ala Gly Ile Ser Ala
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Ser Lys Met Ala Glu Glu Gln Ser Arg Lys Ile His Arg Lys Ala
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Ile Asn Tyr Gly Val Asn Ala Ser Tyr Gln Phe Arg Leu Gly Gln
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Arg Glu Asn Tyr Gln Ser Glu Glu Val Lys Val Gln Thr Pro Ser
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Leu Val Phe Asn Arg Tyr Asn Ala Gly Ile Arg Val Asp Tyr Thr
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Phe Thr Pro Thr Asp Asn Ile Ser Ile Lys Pro Tyr Phe Phe Val
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Asn Tyr Val Asp Val Ser Asn Ala Asn Val Gln Thr Thr Val Asn
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Arg Thr Met Leu Gln Gln Ser Phe Gly Arg Tyr Trp Gln Lys Glu
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Val Gly Leu Lys Ala Glu Ile Leu His Phe Gln Leu Ser Ala Phe
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cactttatt gttcaatagt cgtttaacca cgtatTTTT aatacgaaaa attacttaat	300
taaataaaaca tt atg aaa aaa act gta ttt cgt ctg aat ttt tta acc gct Met Lys Lys Thr Val Phe Arg Leu Asn Phe Leu Thr Ala	351
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tgc att tca tta ggg ata gta tcg caa gcg tgg gca ggt cat act tat Cys Ile Ser Leu Gly Ile Val Ser Gln Ala Trp Ala Gly His Thr Tyr	399
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30 35 40 45	
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aat tta gtt ggc aca tca atg aca aaa gcc cca atg att gat ttt tcc Asn Leu Val Gly Thr Ser Met Thr Lys Ala Pro Met Ile Asp Phe Ser	543
65 70 75	
gtg gtg tcg cga aat ggg gtg gcg gca ttg gtg ggc gat cag tat att Val Val Ser Arg Asn Gly Val Ala Ala Leu Val Gly Asp Gln Tyr Ile	591
80 85 90	
gtg agt gtg gca cat aat gta ggc tat acc aat gtg gat ttt ggt gct Val Ser Val Ala His Asn Val Gly Tyr Thr Asn Val Asp Phe Gly Ala	639
95 100 105	
gaa gga caa aat cct gat caa cat cgt ttt act tat aaa att gtg aaa Glu Gly Gln Asn Pro Asp Gln His Arg Phe Thr Tyr Lys Ile Val Lys	687
110 115 120 125	
cgg aat aat tat aaa aac gat caa acg cat cct tat gag aaa gac tac Arg Asn Asn Tyr Lys Asn Asp Gln Thr His Pro Tyr Glu Lys Asp Tyr	735
130 135 140	
cac aac cca cgc tta cat aaa ttt gtt acg gaa gcc acc cca atc gat His Asn Pro Arg Leu His Lys Phe Val Thr Glu Ala Thr Pro Ile Asp	783
145 150 155	
atg act tct gat atg aac ggc aac aaa tat aca gat agg acg aaa tat Met Thr Ser Asp Met Asn Gly Asn Lys Tyr Thr Asp Arg Thr Lys Tyr	831
160 165 170	
ccc gaa cgc gtg cgt atc ggc tcc ggg tgg cag ttt tgg cga aac gat Pro Glu Arg Val Arg Ile Gly Ser Gly Trp Gln Phe Trp Arg Asn Asp	879
175 180 185	

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gaa atc ctt gaa aaa gat ttg cgt aca tcg ttt tat agc cca tcg ggc Glu Ile Leu Glu Lys Asp Leu Arg Thr Ser Phe Tyr Ser Pro Ser Gly 290 295 300	1215
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act gtt act tgg aaa gta aat ggt gtt gaa aat gat cgc ctt tct aaa	1599

Thr Val Thr Trp Lys Val Asn Gly Val Glu Asn Asp Arg Leu Ser Lys			
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Ile Gly Lys Gly Thr Leu His Val Lys Ala Lys Gly Glu Asn Lys Gly			
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tcg atc agc gta ggc gat ggt aaa gtc att ttg gag cag cag gca gac			1695
Ser Ile Ser Val Gly Asp Gly Lys Val Ile Leu Glu Gln Gln Ala Asp			
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gat caa ggc aac aaa caa gcc ttt agt gaa att ggc ttg gtt agt ggc			1743
Asp Gln Gly Asn Lys Gln Ala Phe Ser Glu Ile Gly Leu Val Ser Gly			
465	470	475	
aga ggt acg gtt cag tta aac gat gac aag caa ttt aat act gat aaa			1791
Arg Gly Thr Val Gln Leu Asn Asp Asp Lys Gln Phe Asn Thr Asp Lys			
480	485	490	
ttt tat ttc ggc ttc cgt ggt cgc tta gat ctt aat ggg cat tca			1839
Phe Tyr Phe Gly Phe Arg Gly Arg Leu Asp Leu Asn Gly His Ser			
495	500	505	
tta acc ttt aaa cgt atc caa aat acg gat gag gga gca acg att gtt			1887
Leu Thr Phe Lys Arg Ile Gln Asn Thr Asp Glu Gly Ala Thr Ile Val			
510	515	520	525
aat cac aat gcc aca aca gaa tct aca gtg acc att act ggc agc gat			1935
Asn His Asn Ala Thr Thr Glu Ser Thr Val Thr Ile Thr Gly Ser Asp			
530	535	540	
acc att aat gac aac act ggc gat tta acc aat aaa cgt gat att gct			1983
Thr Ile Asn Asp Asn Thr Gly Asp Leu Thr Asn Lys Arg Asp Ile Ala			
545	550	555	
ttt aat ggt tgg ttt ggt gat aaa gat gat act aaa aat act gga cgt			2031
Phe Asn Gly Trp Phe Gly Asp Lys Asp Asp Thr Lys Asn Thr Gly Arg			
560	565	570	
ttg aat gtt act tac aat ccg ctt aac aaa gat aat cac ttc ctt cta			2079
Leu Asn Val Thr Tyr Asn Pro Leu Asn Lys Asp Asn His Phe Leu Leu			
575	580	585	
tca ggt gga aca aat tta aaa ggc aat att act caa gac ggt ggc act			2127
Ser Gly Gly Thr Asn Leu Lys Gly Asn Ile Thr Gln Asp Gly Thr			
590	595	600	605
tta gtg ttt agt ggt cgc cca aca cca cac gca tac aat cat tta aat			2175
Leu Val Phe Ser Gly Arg Pro Thr Pro His Ala Tyr Asn His Leu Asn			
610	615	620	
cgc cta aac gag ctt ggg cga cct aag ggc gaa gtg gtt att gat gac			2223
Arg Leu Asn Glu Leu Gly Arg Pro Lys Gly Glu Val Val Ile Asp Asp			
625	630	635	
gat tgg atc aac cgt aca ttt aaa gct gaa aac ttc caa att aaa ggc			2271
Asp Trp Ile Asn Arg Thr Phe Lys Ala Glu Asn Phe Gln Ile Lys Gly			

640	645	650	
gga agt acg gtg gtt tct cgc aat gtt tct tca att gaa gga aat tgg Gly Ser Thr Val Val Ser Arg Asn Val Ser Ser Ile Glu Gly Asn Trp	655	660	665
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aca atc agc aat aac gcc aac gcg aca ttt ggt gtt gtg cca aat caa Thr Ile Ser Asn Asn Ala Asn Ala Thr Phe Gly Val Val Pro Asn Gln	670	675	2367
		680	685
caa aat acc att tgc acg cgt tca gat tgg aca gga tta acg act tgt Gln Asn Thr Ile Cys Thr Arg Ser Asp Trp Thr Gly Leu Thr Thr Cys	690	695	2415
		700	
aaa aca gtt aat tta acc gat aaa aaa gtt att gat tcc ata ccg aca Lys Thr Val Asn Leu Thr Asp Lys Lys Val Ile Asp Ser Ile Pro Thr	705	710	2463
		715	
aca caa att aat ggc tct att aat tta act aat aat gca aca gtg aat Thr Gln Ile Asn Gly Ser Ile Asn Leu Thr Asn Asn Ala Thr Val Asn	720	725	2511
		730	
att cat ggt tta gca aaa ctt aat ggt aat gtc act tta ata aat cat Ile His Gly Leu Ala Lys Leu Asn Gly Asn Val Thr Leu Ile Asn His	735	740	2559
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agc caa ttt aca ttg agc aac aat gcc acc caa aca ggc aat atc caa Ser Gln Phe Thr Leu Ser Asn Asn Ala Thr Gln Thr Gly Asn Ile Gln	750	755	2607
		760	765
ctt tca aat cac gca aat gca acg gtg gat aat gca aac ttg aac ggt Leu Ser Asn His Ala Asn Ala Thr Val Asp Asn Ala Asn Leu Asn Gly	770	775	2655
		780	
aat gtg cat tta acg gat tct gct caa ttt tct tta aaa aac agc cat Asn Val His Leu Thr Asp Ser Ala Gln Phe Ser Leu Lys Asn Ser His	785	790	2703
		795	
ttt tcg cac caa att cag ggc gac aaa gac aca aca gtg acg ttg gaa Phe Ser His Gln Ile Gln Gly Asp Lys Asp Thr Thr Val Thr Leu Glu	800	805	2751
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		825	
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		840	845
aat aat gcg cca cgt cac cgc cgt tca tta gag acg gaa aca acg cca Asn Asn Ala Pro Arg His Arg Arg Ser Leu Glu Thr Glu Thr Thr Pro	850	855	2895
		860	
aca tcg gaa gaa cat cgt ttc aac aca ttg aca gta aat ggt aaa ttg Thr Ser Glu Glu His Arg Phe Asn Thr Leu Thr Val Asn Gly Lys Leu	865	870	2943
		875	

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agc gat aaa ata aaa tta tct aat gac gct gaa ggc gat tac aca tta Ser Asp Lys Ile Lys Leu Ser Asn Asp Ala Glu Gly Asp Tyr Thr Leu 895 900 905	3039
gct gtt cgc gac aca ggc aaa gaa cct gtg acc ctt gag caa tta act Ala Val Arg Asp Thr Gly Lys Glu Pro Val Thr Leu Glu Gln Leu Thr 910 915 920 925	3087
tta att gaa ggc ttg gat aat caa ccc ttg cca gat aag cta aaa att Leu Ile Glu Gly Leu Asp Asn Gln Pro Leu Pro Asp Lys Leu Lys Ile 930 935 940	3135
act tta aaa aat aaa cac gtt gat gcg ggt gca tgg cgt tat gaa tta Thr Leu Lys Asn Lys His Val Asp Ala Gly Ala Trp Arg Tyr Glu Leu 945 950 955	3183
gtg aag aaa aac ggc gaa ttc cgc ttg cat aat cca ata aaa gag cag Val Lys Lys Asn Gly Glu Phe Arg Leu His Asn Pro Ile Lys Glu Gln 960 965 970	3231
gaa ttg cgc aat gat tta gta aaa gca gag caa gta gaa cga gca tta Glu Leu Arg Asn Asp Leu Val Lys Ala Glu Gln Val Glu Arg Ala Leu 975 980 985	3279
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aaa gtg cgg tca aaa aga gcg gcg ttt tct gat acc ccg cct gat Lys Val Arg Ser Lys Arg Ala Ala Phe Ser Asp Thr Pro Pro Asp 1010 1015 1020	3372
caa agc cag tta aac gca tta caa gcc gaa ctc gag acg att aat Gln Ser Gln Leu Asn Ala Leu Gln Ala Glu Leu Glu Thr Ile Asn 1025 1030 1035	3417
gcc caa cag caa gtg gca caa gcg gtg caa aat cag aaa gta act Ala Gln Gln Gln Val Ala Gln Ala Val Gln Asn Gln Lys Val Thr 1040 1045 1050	3462
gca ctt aac caa aag aac gag caa gtt aaa acc act caa gat aaa Ala Leu Asn Gln Lys Asn Glu Gln Val Lys Thr Thr Gln Asp Lys 1055 1060 1065	3507
gca aat tta gtc ttg gca act gca ttg gtg gaa aaa gaa acc gct Ala Asn Leu Val Leu Ala Thr Ala Leu Val Glu Lys Glu Thr Ala 1070 1075 1080	3552
cag att gat ttt gct aat gca aaa tta gct cag ttg aat tta aca Gln Ile Asp Phe Ala Asn Ala Lys Leu Ala Gln Leu Asn Leu Thr 1085 1090 1095	3597

caa caa cta gaa aaa	gcc tta gca gtg gct	gag caa gca gaa aaa	3642
Gln Gln Leu Glu Lys	Ala Leu Ala Val Ala	Glu Gln Ala Glu Lys	
1100	1105	1110	
gag cgt aaa gct caa	gag caa gcg aaa aga	caa cgc aaa caa aaa	3687
Glu Arg Lys Ala Gln	Glu Gln Ala Lys Arg	Gln Arg Lys Gln Lys	
1115	1120	1125	
gac ttg atc agc cgt	tat tca aat agt gcg	tta tca gaa tta tct	3732
Asp Leu Ile Ser Arg	Tyr Ser Asn Ser Ala	Leu Ser Glu Leu Ser	
1130	1135	1140	
gca aca gta aat agt	atg ctt tcc gtt caa	gat gaa tta gat cgt	3777
Ala Thr Val Asn Ser	Met Leu Ser Val Gln	Asp Glu Leu Asp Arg	
1145	1150	1155	
ctt ttt gta gat caa	gct caa tct gcg gtg	tgg aca aat atc tca	3822
Leu Phe Val Asp Gln	Ala Gln Ser Ala Val	Trp Thr Asn Ile Ser	
1160	1165	1170	
cag gat aaa aga cgt	tat gat tct gat gcg	ttc cgt gct tat cag	3867
Gln Asp Lys Arg Arg	Tyr Asp Ser Asp Ala	Phe Arg Ala Tyr Gln	
1175	1180	1185	
cag aaa acg aac ttg	cgt caa att ggg gtg	caa aaa gcc tta gct	3912
Gln Lys Thr Asn Leu	Arg Gln Ile Gly Val	Gln Lys Ala Leu Ala	
1190	1195	1200	
aac gga cga att ggg	gca gtt ttc tcg cat	agc cgt tca gat aat	3957
Asn Gly Arg Ile Gly	Ala Val Phe Ser His	Ser Arg Ser Asp Asn	
1205	1210	1215	
act ttt gat gaa cag	gtt aaa aat cac gca	aca tta acg atg atg	4002
Thr Phe Asp Glu Gln	Val Lys Asn His Ala	Thr Leu Thr Met Met	
1220	1225	1230	
tcg ggt ttt gcc caa	tat caa tgg ggt gat	tta caa ttt ggt gta	4047
Ser Gly Phe Ala Gln	Tyr Gln Trp Gly Asp	Leu Gln Phe Gly Val	
1235	1240	1245	
aac gtg gga acg gga	att agt gcg agt aaa	atg gct gaa gaa caa	4092
Asn Val Gly Thr Gly	Ile Ser Ala Ser Lys	Met Ala Glu Glu Gln	
1250	1255	1260	
agc cga aaa att cat	cga aaa gcg ata aat	tat ggc gtg aat gca	4137
Ser Arg Lys Ile His	Arg Lys Ala Ile Asn	Tyr Gly Val Asn Ala	
1265	1270	1275	
agt tat tcg ttc cat	tta ggg caa ttg ggt	att cag cct tat ttt	4182
Ser Tyr Ser Phe His	Leu Gly Gln Leu Gly	Ile Gln Pro Tyr Phe	
1280	1285	1290	
gga gtt aat cgc tat	ttt att gaa cgt aaa	aat tat caa tct gag	4227
Gly Val Asn Arg Tyr	Phe Ile Glu Arg Lys	Asn Tyr Gln Ser Glu	
1295	1300	1305	
gaa gtg aaa gtg caa	aca ccg agc ctt gca	ttt aat cgc tat aat	4272

Glu Val Lys Val Gln	Thr Pro Ser Leu Ala	Phe Asn Arg Tyr Asn	
1310	1315	1320	
gct gga gta cggttc gat tat acgttt acc ccg aca gag aat atc			
Ala Gly Val Arg Val	Asp Tyr Thr Phe Thr	Pro Thr Glu Asn Ile	4317
1325	1330	1335	
agc gtt aag cct tat ttcttc gtc aat tat gtt gat gtt tca aac			
Ser Val Lys Pro Tyr	Phe Phe Val Asn Tyr	Val Asp Val Ser Asn	4362
1340	1345	1350	
gct aac gta caa acc act gta aat cgc gcg gtgttg caa caa cca			
Ala Asn Val Gln Thr	Thr Val Asn Arg Ala	Val Leu Gln Gln Pro	4407
1355	1360	1365	
ttt gga cgt tat tgg caaaa gaa gtggaa ttaaaa gcg gaa att			
Phe Gly Arg Tyr Trp	Gln Lys Glu Val Gly	Leu Lys Ala Glu Ile	4452
1370	1375	1380	
tta cat ttc caa ctt tct gct ttt att tct aaa tct caa ggt tcg			
Leu His Phe Gln Leu	Ser Ala Phe Ile Ser	Lys Ser Gln Gly Ser	4497
1385	1390	1395	
caa ctc ggt aaa cag cga aat atg ggc gtg aaa tta gga tat cgt			
Gln Leu Gly Lys Gln	Arg Asn Met Gly Val	Lys Leu Gly Tyr Arg	4542
1400	1405	1410	
tgg taa aaatcaacat aattttatttc taataatgga actttatatta attaaaagta			
Trp			4598
tcttaagtagc accctataagg ggattaatta agaggattta ataatgaatt taactaaaat			
tttacccgca tttgctgctg cagtcgtatt atctgcttgt gcaaaggatg cacctgaaat			
gacaaaatca tctgcgcaaa tagctgaaat gcaaacactt ccaacaatca ctgataaaac			
agttgtatat tcttgcaata aacaaactgt gactgcagtg tatcaatttg			
<210> 17			
<211> 1411			
<212> PRT			
<213> Haemophilus influenzae			
<400> 17			
Met Lys Lys Thr Val Phe Arg Leu Asn Phe Leu Thr Ala Cys Ile Ser			
1	5	10	15
Leu Gly Ile Val Ser Gln Ala Trp Ala Gly His Thr Tyr Phe Gly Ile			
20	25	30	
Asp Tyr Gln Tyr Tyr Arg Asp Phe Ala Glu Asn Lys Gly Lys Phe Thr			
35	40	45	

Val Gly Ala Lys Asn Ile Glu Val Tyr Asn Lys Asn Gly Asn Leu Val
50 55 60

Gly Thr Ser Met Thr Lys Ala Pro Met Ile Asp Phe Ser Val Val Ser
65 70 75 80

Arg Asn Gly Val Ala Ala Leu Val Gly Asp Gln Tyr Ile Val Ser Val
85 90 95

Ala His Asn Val Gly Tyr Thr Asn Val Asp Phe Gly Ala Glu Gly Gln
100 105 110

Asn Pro Asp Gln His Arg Phe Thr Tyr Lys Ile Val Lys Arg Asn Asn
115 120 125

Tyr Lys Asn Asp Gln Thr His Pro Tyr Glu Lys Asp Tyr His Asn Pro
130 135 140

Arg Leu His Lys Phe Val Thr Glu Ala Thr Pro Ile Asp Met Thr Ser
145 150 155 160

Asp Met Asn Gly Asn Lys Tyr Thr Asp Arg Thr Lys Tyr Pro Glu Arg
165 170 175

Val Arg Ile Gly Ser Gly Trp Gln Phe Trp Arg Asn Asp Gln Asn Asn
180 185 190

Gly Asp Gln Val Ala Gly Ala Tyr His Tyr Leu Thr Ala Gly Asn Thr
195 200 205

His Asn Gln Gly Gly Ala Gly Gly Trp Ser Ser Leu Ser Gly Asp
210 215 220

Val Arg Gln Ala Gly Asn Tyr Gly Pro Ile Pro Ile Ala Gly Ser Ser
225 230 235 240

Gly Asp Ser Gly Ser Pro Met Phe Ile Tyr Asp Ala Glu Lys Gln Lys
245 250 255

Trp Leu Ile Asn Gly Val Leu Arg Thr Gly Asn Pro Trp Ala Gly Thr
260 265 270

Glu Asn Thr Phe Gln Leu Val Arg Lys Ser Phe Phe Asp Glu Ile Leu
275 280 285

Glu Lys Asp Leu Arg Thr Ser Phe Tyr Ser Pro Ser Gly Asn Gly Ala
290 295 300

Tyr Thr Ile Thr Asp Lys Gly Asp Gly Ser Gly Ile Val Lys Gln Gln
305 310 315 320

Thr Gly Arg Pro Ser Glu Val Arg Ile Gly Leu Lys Asp Asp Lys Leu
325 330 335

Pro Ala Glu Gly Lys Asp Asp Val Tyr Gln Tyr Gln Gly Pro Asn Ile
340 345 350

Tyr Leu Pro Arg Leu Asn Asn Gly Gly Asn Leu Tyr Phe Gly Asp Gln
355 360 365

Lys Asn Gly Thr Val Thr Leu Ser Thr Asn Ile Asn Gln Gly Ala Gly
370 375 380

Gly Leu Tyr Phe Glu Gly Asn Phe Thr Val Ser Ser Glu Asn Asn Ala
385 390 395 400

Thr Trp Gln Gly Ala Gly Val His Val Gly Glu Asp Ser Thr Val Thr
405 410 415

Trp Lys Val Asn Gly Val Glu Asn Asp Arg Leu Ser Lys Ile Gly Lys
420 425 430

Gly Thr Leu His Val Lys Ala Lys Gly Glu Asn Lys Gly Ser Ile Ser
435 440 445

Val Gly Asp Gly Lys Val Ile Leu Glu Gln Gln Ala Asp Asp Gln Gly
450 455 460

Asn Lys Gln Ala Phe Ser Glu Ile Gly Leu Val Ser Gly Arg Gly Thr
465 470 475 480

Val Gln Leu Asn Asp Asp Lys Gln Phe Asn Thr Asp Lys Phe Tyr Phe
485 490 495

Gly Phe Arg Gly Gly Arg Leu Asp Leu Asn Gly His Ser Leu Thr Phe
500 505 510

Lys Arg Ile Gln Asn Thr Asp Glu Gly Ala Thr Ile Val Asn His Asn
515 520 525

Ala Thr Thr Glu Ser Thr Val Thr Ile Thr Gly Ser Asp Thr Ile Asn
530 535 540

Asp Asn Thr Gly Asp Leu Thr Asn Lys Arg Asp Ile Ala Phe Asn Gly
545 550 555 560

Trp Phe Gly Asp Lys Asp Asp Thr Lys Asn Thr Gly Arg Leu Asn Val
565 570 575

Thr Tyr Asn Pro Leu Asn Lys Asp Asn His Phe Leu Leu Ser Gly Gly
580 585 590

Thr Asn Leu Lys Gly Asn Ile Thr Gln Asp Gly Gly Thr Leu Val Phe
595 600 605

Ser Gly Arg Pro Thr Pro His Ala Tyr Asn His Leu Asn Arg Leu Asn
610 615 620

Glu Leu Gly Arg Pro Lys Gly Glu Val Val Ile Asp Asp Asp Trp Ile
625 630 635 640

Asn Arg Thr Phe Lys Ala Glu Asn Phe Gln Ile Lys Gly Gly Ser Thr
645 650 655

Val Val Ser Arg Asn Val Ser Ser Ile Glu Gly Asn Trp Thr Ile Ser
660 665 670

Asn Asn Ala Asn Ala Thr Phe Gly Val Val Pro Asn Gln Gln Asn Thr
675 680 685

Ile Cys Thr Arg Ser Asp Trp Thr Gly Leu Thr Thr Cys Lys Thr Val
690 695 700

Asn Leu Thr Asp Lys Lys Val Ile Asp Ser Ile Pro Thr Thr Gln Ile
705 710 715 720

Asn Gly Ser Ile Asn Leu Thr Asn Asn Ala Thr Val Asn Ile His Gly

725

730

735

Leu Ala Lys Leu Asn Gly Asn Val Thr Leu Ile Asn His Ser Gln Phe
740 745 750

Thr Leu Ser Asn Asn Ala Thr Gln Thr Gly Asn Ile Gln Leu Ser Asn
755 760 765

His Ala Asn Ala Thr Val Asp Asn Ala Asn Leu Asn Gly Asn Val His
770 775 780

Leu Thr Asp Ser Ala Gln Phe Ser Leu Lys Asn Ser His Phe Ser His
785 790 795 800

Gln Ile Gln Gly Asp Lys Asp Thr Thr Val Thr Leu Glu Asn Ala Thr
805 810 815

Trp Thr Met Pro Ser Asp Thr Thr Leu Gln Asn Leu Thr Leu Asn Asn
820 825 830

Ser Thr Val Thr Leu Asn Ser Ala Tyr Ser Ala Ser Ser Asn Asn Ala
835 840 845

Pro Arg His Arg Arg Ser Leu Glu Thr Glu Thr Thr Pro Thr Ser Glu
850 855 860

Glu His Arg Phe Asn Thr Leu Thr Val Asn Gly Lys Leu Ser Gly Gln
865 870 875 880

Gly Thr Phe Gln Phe Thr Ser Ser Leu Phe Gly Tyr Lys Ser Asp Lys
885 890 895

Ile Lys Leu Ser Asn Asp Ala Glu Gly Asp Tyr Thr Leu Ala Val Arg
900 905 910

Asp Thr Gly Lys Glu Pro Val Thr Leu Glu Gln Leu Thr Leu Ile Glu
915 920 925

Gly Leu Asp Asn Gln Pro Leu Pro Asp Lys Leu Lys Ile Thr Leu Lys
930 935 940

Asn Lys His Val Asp Ala Gly Ala Trp Arg Tyr Glu Leu Val Lys Lys
945 950 955 960

Asn Gly Glu Phe Arg Leu His Asn Pro Ile Lys Glu Gln Glu Leu Arg
965 970 975

Asn Asp Leu Val Lys Ala Glu Gln Val Glu Arg Ala Leu Glu Ala Lys
980 985 990

Gln Ala Glu Leu Thr Thr Lys Lys Gln Lys Thr Glu Ala Lys Val Arg
995 1000 1005

Ser Lys Arg Ala Ala Phe Ser Asp Thr Pro Pro Asp Gln Ser Gln
1010 1015 1020

Leu Asn Ala Leu Gln Ala Glu Leu Glu Thr Ile Asn Ala Gln Gln
1025 1030 1035

Gln Val Ala Gln Ala Val Gln Asn Gln Lys Val Thr Ala Leu Asn
1040 1045 1050

Gln Lys Asn Glu Gln Val Lys Thr Thr Gln Asp Lys Ala Asn Leu
1055 1060 1065

Val Leu Ala Thr Ala Leu Val Glu Lys Glu Thr Ala Gln Ile Asp
1070 1075 1080

Phe Ala Asn Ala Lys Leu Ala Gln Leu Asn Leu Thr Gln Gln Leu
1085 1090 1095

Glu Lys Ala Leu Ala Val Ala Glu Gln Ala Glu Lys Glu Arg Lys
1100 1105 1110

Ala Gln Glu Gln Ala Lys Arg Gln Arg Lys Gln Lys Asp Leu Ile
1115 1120 1125

Ser Arg Tyr Ser Asn Ser Ala Leu Ser Glu Leu Ser Ala Thr Val
1130 1135 1140

Asn Ser Met Leu Ser Val Gln Asp Glu Leu Asp Arg Leu Phe Val
1145 1150 1155

Asp Gln Ala Gln Ser Ala Val Trp Thr Asn Ile Ser Gln Asp Lys
1160 1165 1170

Arg Arg Tyr Asp Ser Asp Ala Phe Arg Ala Tyr Gln Gln Lys Thr
1175 1180 1185

Asn Leu Arg Gln Ile Gly Val Gln Lys Ala Leu Ala Asn Gly Arg
1190 1195 1200

Ile Gly Ala Val Phe Ser His Ser Arg Ser Asp Asn Thr Phe Asp
1205 1210 1215

Glu Gln Val Lys Asn His Ala Thr Leu Thr Met Met Ser Gly Phe
1220 1225 1230

Ala Gln Tyr Gln Trp Gly Asp Leu Gln Phe Gly Val Asn Val Gly
1235 1240 1245

Thr Gly Ile Ser Ala Ser Lys Met Ala Glu Glu Gln Ser Arg Lys
1250 1255 1260

Ile His Arg Lys Ala Ile Asn Tyr Gly Val Asn Ala Ser Tyr Ser
1265 1270 1275

Phe His Leu Gly Gln Leu Gly Ile Gln Pro Tyr Phe Gly Val Asn
1280 1285 1290

Arg Tyr Phe Ile Glu Arg Lys Asn Tyr Gln Ser Glu Glu Val Lys
1295 1300 1305

Val Gln Thr Pro Ser Leu Ala Phe Asn Arg Tyr Asn Ala Gly Val
1310 1315 1320

Arg Val Asp Tyr Thr Phe Thr Pro Thr Glu Asn Ile Ser Val Lys
1325 1330 1335

Pro Tyr Phe Phe Val Asn Tyr Val Asp Val Ser Asn Ala Asn Val
1340 1345 1350

Gln Thr Thr Val Asn Arg Ala Val Leu Gln Gln Pro Phe Gly Arg
1355 1360 1365

Tyr Trp Gln Lys Glu Val Gly Leu Lys Ala Glu Ile Leu His Phe
1370 1375 1380

Gln Leu Ser Ala Phe Ile Ser Lys Ser Gln Gly Ser Gln Leu Gly
1385 1390 1395

Lys Gln Arg Asn Met Gly Val Lys Leu Gly Tyr Arg Trp
1400 1405 1410

<210> 18
<211> 47
<212> PRT
<213> *Haemophilus influenzae*

<400> 18

Met Lys Lys Thr Val Phe Arg Leu Asn Phe Leu Thr Ala Cys Ile Ser
1 5 10 15

Leu Gly Ile Val Ser Gln Ala Trp Ala Gly His Thr Tyr Phe Gly Ile
20 25 30

Asp Tyr Gln Tyr Tyr Arg Asp Phe Ala Glu Asn Lys Gly Lys Phe
35 40 45

<210> 19
<211> 7
<212> PRT
<213> *Haemophilus influenzae*

<400> 19

Asn Pro Asp Gln His Arg Phe
1 5

<210> 20
<211> 11
<212> PRT
<213> *Haemophilus influenzae*

<400> 20

Gly Asp Ser Gly Ser Pro Met Phe Ile Tyr Asp
1 5 10

<210> 21
<211> 14
<212> PRT
<213> *Haemophilus influenzae*

<400> 21

Ile Asn Gln Gly Ala Gly Gly Leu Tyr Phe Glu Gly Asn Gly

1

5

10

<210> 22
<211> 7
<212> PRT
<213> **Haemophilus influenzae**

<400> 22

Asp Arg Leu Ser Lys Ile Gly
1 5

<210> 23
<211> 18
<212> PRT
<213> **Haemophilus influenzae**

<400> 23

Tyr Phe Gly Phe Arg Gly Gly Arg Leu Asp Leu Asn Gly His Ser Leu
1 5 10 15

Thr Phe

<210> 24
<211> 15
<212> PRT
<213> **Haemophilus influenzae**

<400> 24

Arg Ile Gln Asn Thr Asp Glu Gly Ala Met Ile Val Asn His Asn
1 5 10 15

<210> 25
<211> 9
<212> PRT
<213> **Haemophilus influenzae**

<400> 25

Leu Leu Leu Ser Gly Gly Thr Asn Leu
1 5

<210> 26
<211> 13
<212> PRT
<213> **Haemophilus influenzae**

<400> 26

Phe Ser Gly Arg Pro Thr Pro His Ala Tyr Asn His Leu
1 5 10

<210> 27
<211> 36
<212> PRT
<213> Haemophilus influenzae

<400> 27

Arg Thr Phe Lys Ala Glu Asn Phe Gln Ile Lys Gly Gly Ser Ala Val
1 5 10 15

Val Ser Arg Asn Val Ser Ser Ile Glu Gly Asn Trp Thr Val Ser Asn
20 25 30

Asn Ala Asn Ala
35

<210> 28
<211> 23
<212> PRT
<213> Haemophilus influenzae

<400> 28

Phe Gly Val Val Pro Asn Gln Gln Asn Thr Ile Cys Thr Arg Ser Asp
1 5 10 15

Trp Thr Gly Leu Thr Thr Cys
20

<210> 29
<211> 7
<212> PRT
<213> Haemophilus influenzae

<400> 29

Lys Val Ile Asn Ser Ile Pro
1 5

<210> 30
<211> 14
<212> PRT
<213> Haemophilus influenzae

<400> 30

Thr Gln Ile Asn Gly Ser Ile Asn Leu Thr Asp Asn Ala Thr
1 5 10

<210> 31
<211> 11
<212> PRT
<213> *Haemophilus influenzae*

<400> 31

Gly Leu Ala Lys Leu Asn Gly Asn Val Thr Leu
1 5 10

<210> 32
<211> 12
<212> PRT
<213> *Haemophilus influenzae*

<400> 32

His Ser Gln Phe Thr Leu Ser Asn Asn Ala Thr Gln
1 5 10

<210> 33
<211> 12
<212> PRT
<213> *Haemophilus influenzae*

<400> 33

Ala Thr Val Asp Asn Ala Asn Leu Asn Gly Asn Val
1 5 10

<210> 34
<211> 18
<212> PRT
<213> *Haemophilus influenzae*

<400> 34

Asp Ser Ala Gln Phe Ser Leu Lys Asn Ser His Phe Ser His Gln Ile
1 5 10 15

Gln Gly

<210> 35
<211> 11
<212> PRT
<213> *Haemophilus influenzae*

<400> 35

Leu Glu Asn Ala Thr Trp Thr Met Pro Ser Asp
1 5 10

<210> 36

<211> 11

<212> PRT

<213> Haemophilus influenzae

<400> 36

Thr Leu Gln Asn Leu Thr Leu Asn Asn Ser Thr
1 5 10

<210> 37

<211> 8

<212> PRT

<213> Haemophilus influenzae

<400> 37

Thr Leu Asn Ser Ala Tyr Ser Ala
1 5

<210> 38

<211> 54

<212> PRT

<213> Haemophilus influenzae

<400> 38

Arg Arg Ser Leu Glu Thr Glu Thr Thr Pro Thr Ser Ala Glu His Arg
1 5 10 15

Phe Asn Thr Leu Thr Val Asn Gly Lys Leu Ser Gly Gln Gly Thr Phe
20 25 30

Gln Phe Thr Ser Ser Leu Phe Gly Tyr Lys Ser Asp Lys Leu Ser Asn
35 40 45

Asp Ala Glu Gly Asp Tyr
50

<210> 39

<211> 10

<212> PRT

<213> Haemophilus influenzae

<400> 39

Leu Ser Val Arg Asn Thr Gly Lys Glu Pro
1 5 10

<210> 40
<211> 10
<212> PRT
<213> Haemophilus influenzae

<400> 40

Gln Leu Thr Leu Val Glu Ser Lys Asp Asn
1 5 10

<210> 41
<211> 20
<212> PRT
<213> Haemophilus influenzae

<400> 41

Phe Thr Leu Glu Asn Asp His Val Asp Ala Gly Ala Leu Arg Tyr Lys
1 5 10 15

Leu Val Lys Asn
20

<210> 42
<211> 14
<212> PRT
<213> Haemophilus influenzae

<400> 42

Gly Glu Phe Arg Leu His Asn Pro Ile Lys Glu Gln Glu Leu
1 5 10

<210> 43
<211> 18
<212> PRT
<213> Haemophilus influenzae

<400> 43

Asp Leu Val Arg Ala Glu Gln Ala Glu Arg Thr Leu Glu Ala Lys Gln
1 5 10 15

Val Glu

<210> 44
<211> 73
<212> PRT
<213> Haemophilus influenzae

<400> 44

Leu Ile Ser Arg Tyr Ser Asn Ser Ala Leu Ser Glu Leu Ser Ala Thr
1 5 10 15

Val Asn Ser Met Leu Ser Val Gln Asp Glu Leu Asp Arg Leu Phe Val
20 25 30

Asp Gln Ala Gln Ser Ala Val Trp Thr Asn Ile Ala Gln Asp Lys Arg
35 40 45

Arg Tyr Asp Ser Asp Ala Phe Arg Ala Tyr Gln Gln Lys Thr Asn Leu
50 55 60

Arg Gln Ile Gly Val Gln Lys Ala Leu
65 70

<210> 45
<211> 27
<212> PRT
<213> Haemophilus influenzae

<400> 45

Asn Gly Arg Ile Gly Ala Val Phe Ser His Ser Arg Ser Asp Asn Thr
1 5 10 15

Phe Asp Glu Gln Val Lys Asn His Ala Thr Leu
20 25

<210> 46
<211> 20
<212> PRT
<213> Haemophilus influenzae

<400> 46

Met Met Ser Gly Phe Ala Gln Tyr Gln Trp Gly Asp Leu Gln Phe Gly
1 5 10 15

Val Asn Val Gly
20

<210> 47
<211> 40
<212> PRT
<213> Haemophilus influenzae

<400> 47

Gly Ile Ser Ala Ser Lys Met Ala Glu Glu Gln Ser Arg Lys Ile His
1 5 10 15

Arg Lys Ala Ile Asn Tyr Gly Val Asn Ala Ser Tyr Gln Phe Arg Lys
20 25 30

Gly Gln Leu Gly Ile Gln Pro Tyr
35 40

<210> 48
<211> 17
<212> PRT
<213> Haemophilus influenzae

<400> 48

Gly Val Asn Arg Tyr Phe Ile Glu Arg Glu Asn Tyr Gln Ser Glu Glu
1 5 10 15

Val

<210> 49
<211> 20
<212> PRT
<213> Haemophilus influenzae

<400> 49

Phe Asn Arg Asn Ala Gly Ile Arg Val Asp Tyr Thr Phe Thr Pro Thr
1 5 10 15

Asp Asn Ile Ser
20

<210> 50
<211> 21
<212> PRT
<213> Haemophilus influenzae

<400> 50

Lys Pro Tyr Phe Phe Val Asn Tyr Val Asp Val Ser Asn Ala Asn Val

1

5

10

15

Gln Thr Thr Val Asn
20

<210> 51
<211> 19
<212> PRT
<213> Haemophilus influenzae

<400> 51

Phe Gly Arg Tyr Trp Gln Lys Glu Val Gly Leu Lys Ala Glu Ile Leu
1 5 10 15

His Phe Gln

<210> 52
<211> 26
<212> PRT
<213> Haemophilus influenzae

<400> 52

Ser Ala Phe Ile Ser Lys Ser Gln Gly Ser Gln Leu Gly Lys Gln Gln
1 5 10 15

Asn Val Gly Val Lys Leu Gly Tyr Arg Trp
20 25

<210> 53
<211> 8
<212> PRT
<213> Haemophilus influenzae

<400> 53

Gly Asp Ser Gly Ser Pro Met Phe
1 5

<210> 54
<211> 8
<212> PRT
<213> Neisseria gonorrhoeae

<400> 54

Gly Asp Ser Gly Ser Pro Leu Phe
1 5

<210> 55
<211> 7
<212> PRT
<213> Haemophilus influenzae

<400> 55

His Thr Tyr Phe Gly Ile Asp
1 5

<210> 56
<211> 28
<212> DNA
<213> Haemophilus influenzae

<400> 56
tgccaggatcc ccgcagactg gattgttg

28

<210> 57
<211> 28
<212> DNA
<213> Haemophilus influenzae

<400> 57
tgccaggatcc gatctgcccc accttggtt

28

<210> 58
<211> 7
<212> PRT
<213> Haemophilus influenzae

<400> 58

Gly Asp Ser Gly Ser Pro Met
1 5